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STUDIES FROM THE PSYCHOLOGICAL LABORA-
TORY OF HARVARD UNIVERSITY

The Psycho-physiological Effect of the Elements of Speech in Relation to Poetry

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THE PSYCHO-PHYSIOLOGICAL EFFECT OF THE ELEMENTS OF SPEECH IN RELATION TO POETRY

The purpose of this investigation is to determine by means of the expressive method the effects produced by the speech elements in poetry upon both the motor and introspective consciousness.

Lying on the borderland between Esthetics and Psychology, the investigation aims to throw light (1) upon the so-called "tonal theory of poetry," by measuring the emotional value of the sounds in poetic language without reference to alliterative or grammatical devices, and (2) to discover what auditory, kinaesthetic and organic sensations are aroused by the play of vocal functions in meaningful as well as meaningless collocations of the elements of language.

The material is presented in the following order:

1. A statistical determination of the frequency of the various speech elements in English poetry,
2. Experiments upon the psycho-physiological effect of such elements combined in simple relations,
3. Transmogrifications of English poetry to determine reaction to the bare tonal elements, and
4. The esthetic and psycho-physiological question: Is the psycho-physiological value of the poetic sum equal to the sum of the psycho-physiological values of the separately contributing phonetic elements?

1. SOUND FREQUENCY IN ENGLISH POETRY

Prior to undertaking the experimental work in the laboratory, an elaborate statistical record was made by the writer of the percentage of frequency of the various letter sounds in the leading English poets from Sydney to Rossetti. The basis for this work was the observation of very striking differences in the acoustic and kinaesthetic sensations aroused by the audible

reading of different poets. Especially was the motor pattern and the tonal display of such poets as Byron and Keats noticed, and upon analysis it was found that sound frequency was one element likely to contribute to the differences between the effects which they produced. A previous study of vocal music to provide an increased sensitivity to tonal effects, and of phonography to hasten the sensori-motor reactions necessary in making the tabulations were found to have been invaluable psychological instruments in this preliminary work. This analysis required over four years and involved the recording of over 540,000 tonal elements; 46 phonetic rubrics were employed, and where doubt was entertained over the classification of the elements under the various rubrics, recourse was had to general poetic usage as well as to the special idiosyncracies of the individual poets. All the poets were analysed upon the basis of the current English speech, the Standard Dictionary being used as the criterion for pronunciation. The "foot- and -quantity" system was employed to determine the accentuation, and both accented and unaccented sounds were registered in the tabulations. Approximately 1,000 lines of the maturest and most melodious verse of each of the poets were examined. The result of this work is here summarized:

I. English poets usually employ about 10 accented to 8 unaccented sounds. Shelley, Browning and Swinburne are the notable exceptions, each of which gives the ratio of nearly 10 to 10. But their rhythmic patterns determine much of this.

II. Greater variations, general and individual, are noticed in the use of the accented than of the unaccented sounds.

III. Tennyson and Swinburne deviate most from the average use of the sounds; Milton is nearest the average of all the poets examined.

IV. The greatest individual variations are found among the most used accented consonants which occur in the following descending order of frequency: R, N, L, T, S, D, M, etc. But the smallest individual variations in the use of the unaccented sounds occur among those of the greatest frequency of use, namely: ũ, ĭ, ă.

Only a few double consonantal rubrics were employed besides

the familiar Ch, Wh (Hw), Ng, Sh, and Zh; such double sounds as Bl, Cr, etc., were split and tabulated as two sounds. While the work was in progress Josselyn's investigations (see Scripture, "Elements of Experimental Phonetics," p. 501) came to hand, in which it was shown that a double consonant was simply a single one strengthened and lengthened, in so far as the time estimation of rhythmic syllables was concerned; but whether the double or triple consonantal combinations were felt as fusions or as additions did not enter in as a standardizing agent in the above work of tabulation.

Perhaps the most striking thing in the whole work was the constant observation of the modifying influence of R. Besides being the most used sound in English poetry, it is the one most frequently observed as modifying the quality of juxtaposed vowels and consonants, and when so found, its local signature is absorbed by them.

2. THE PSYCHO-PHYSIOLOGICAL EFFECT OF SIMPLE SOUNDS

The experimental work was carried on in the Psychological Laboratory of Harvard University from 1911 to 1914. It began with the audible recitation of groups of five iambs, such as la-mo, la-bo, and la-do. The O was long, and the A was given as the 'Italian' A. On account of the neglect it received in the arsus, however, it became the neutral vowel. The time of the recitation was taken and the chief results were: the appearance of a caesura, the feeling of satisfyingness at the fifth iambic, the changes in feeling-tone, sensations and imagery, as the different combinations were presented. Only the above three iambs were employed this way; in order to obtain a record that was valuable for the correlation of so motor a function as speech, some graphic record had to be employed.

HISTORICAL

Brücke¹ had obtained kymograph records of ictus and arsis by means of a quill marker while various kinds of verse were

¹ Brücke, "Die physiologischen Grundlagen der neuhochdeutschen Kunst."

recited.² Lip movements were also recorded by means of a lever passing from the lips to the kymograph. His findings were that the time taken to tap various kinds of poetic feet were almost equal; at least the arses recurred at equal periods of time, and the abruptness of the departure of the kymographic tracings from the abscissa line was found to vary considerably for different poetic metres.

Bourdon³ had traced the neck vibrations at a particularly mobile place, while certain sounds were uttered, and found very great amplitudes for the vowel I, less great for O, and lesser still for A. It appears, however, that the average amplitudes for combinations of consonants with O was greater than those with I and A; the I-combinations being quite the lowest.

In regard to what one might expect with reference to the general permeability of the psycho-motor organism to stirrings of various sorts, Angell⁴ held that "only those sensations breaking in upon a state of relative quiet disturbed the psycho-physical mechanism enough to make any peripheral difference."

Fere's opinion⁵ on this matter is that a momentary intellectual activity is accompanied by a momentary increase in power of the voluntary muscles. He also found that both under the influence of an intellectual effort and of other things (*e.g.*, speech and odors) certain excitations of the muscular sense were aroused. His studies showed that during the exercise of speech the movements of the right hand were influenced, *i.e.*, augmented, just as one works a treadle with the foot and finds the synchronous hand movements augmented as much as a 6th or a 5th; it is even stated that the right hand in gesture plays a veritable "esthesiogenic" rôle. But the correlation of the amount of energy expended with pleasurable or unpleasurable states, Fere does not report in the case of speech; in connection with odors and the

² The study was not of the pure iambic or other line; inversions of feet occurred, as usual.

³ Bourdon, P., "L'application de la methode graphique a l'etude de l'intensité de la voix," *L'Annee Psychologique*, 1897.

⁴ Angell, J. R., "Organic processes and consciousness," *Psych. Rev.*, 1890.

⁵ Fere, Ch., "Sensation et Mouvement," 1900, esp. Chap. 3.

like, the greater energy seems to be aroused in a state of pleasure. But the final generalization is in these terms: "La sensation de plaisir se resout donc dans une sensation de puissance; la sensation de déplaisir dans une sensation d'impuissance."

The development of the expressive method itself is a fitting corollary to the "modern tendency to understand all consciousness in motor terms," and to connect it with the "motor rather than the sensory side of the organism."⁶ Professor Münsterberg's action theory allies itself with the same tendency. Such writers as Dearborn,⁷ Pillsbury,⁸ Alexander,⁹ and others give a large place to the psycho-motor side of the neural arc, though treating the consciously volitional side of consciousness with varying degrees of prominence.

In their experiments upon the "Time relations of poetic metres,"¹⁰ Hurst and Mackay appear to have justified somewhat the method of poetic analysis used herein (only indirectly, however), and while their subjects only scanned silently or tapped empty rhythms, they found that the iambic foot was really short-long and thus that the tapping of the metrical unit laid a stress upon the so-called accented syllable. Inasmuch as greater differences appear among the poets (as found by the tables previously mentioned) in the use of accented than of unaccented sounds, the above results are pertinent to the present investigation. Further comparisons of method and results are hardly possible; they used the iambic foot only in octosyllabic lines, (*e.g.*, Scott's poems), and even then the iambus was frequently exchanged for other kinds of feet.

Scripture's subjects¹¹ read rather than scanned poetry. Triplet and Sandford¹² found that the explosive consonants were

⁶ Kostyleff, quoted from E. B. Delabarre, "Volition and motor consciousness-theory," *Psych. Bull.*, 1912.

⁷ Dearborn, G. V. N., "The relation of muscular activity to the mental process," *Am. Ed. Rev.*, 1909 (14) 18.

⁸ "The place of movement in consciousness," *Psych. Rev.*, 1911, (18) 83-99.

⁹ *Brit. Jour. of Psych.*, 1911 (4) pp. 239-67.

¹⁰ Univ. of Toronto Studies, No. 3, 1899.

¹¹ Scripture, E. W., *Yale Psych. Stud.*, Vol. VII, 1899.

¹² "Studies of rhythm and meter," *Am. Jour. of Psych.*, XII, 1901.

more nearly tapped and spoken at identical times than were the others. S was almost always syncoped. But in the general, they found that finger stress indicates quite well the vocal stress, though minuter correlations are not indicated. To the above results we ally those of Meumann¹³ which state that the time limit of syncope is but 0.02 seconds. Miyake¹⁴ found that the beat of the finger came before the beginning of the vowel when it stood alone, when it had a glottal catch, when it was short or long, followed by a final consonant, or when it was short or long between two consonants. Also, except in the case of B, D, and G, the beat as tapped came before the vowel following these consonants.

With regard to the matter of correlating qualitative consciousness states with the motor consciousness, there is to be mentioned Dressler's work¹⁵ where increased central activity seemed to favor increased rapidity in voluntary movements; also the work of Drozynski¹⁶ which does not crystallize into any specific positive correlation, but shows apparently that the unpleasant stimuli gave the more noticeable arousals. But by 'unpleasant' we must understand here the many meanings of the term in the sense of Wundt's tridimensional theory. This writer used no iambics.¹⁷

So much for a general account of some of the more important and resultful experimentations upon the motor and introspective phases of an expressive method in psychological esthetics (especially *in re.* poetry). But to come down to the particular elements of our own research, especially the form of the rhythmical presentation and the apparatus used; and first the rhythm form.

¹³ "Untersuchungen zur Psych. und Aesth. der Rhythmus," *Wundt's Studien*, X, 1894, p. 419.

¹⁴ See Scripture, "Elements of Experimental Phonetics," esp. Chap. 37.

¹⁵ "Excitement and tapping rates," *Am. Jour. of Psych.*, 1891, IV, p. 523.

¹⁶ "Atmungs und Pulssymptome rhythmischer Gefühle," *Wundt's Psych. Stud.*, Vol. 7, pp. 83-140.

¹⁷ See also for the effects of pleasant and unpleasant music, F. Rehwoldt, "Ueber respiratorische Affectssymptome," *Wundt's Stud.*, Vol. 3, pp. 149-192.

Excerpt

Keeling

THE CHOICE OF THE IAMBIC FOOT

It was shown above that iambus is a sufficiently characteristic form to be used as a vehicle for sounds (*op. cit.* Hurst and Mackay). There is another justification, however. From the writer's own experience in the field of literature, the standard, as well as the most dignified line of English poetry is the iambic, decasyllabic line; the comic finds a place much more readily in the octosyllabic (and trochaic) line, or in still smaller forms. No longer line than this has succeeded for great lengths of verse, and most of the sustained work of any considerable length (barring of course Coleridge's "Lyrical Ballads") is written in it, and even lighter works such as sonnets are not rendered over heavy by its use. The iambic foot was chosen because it appeared to be the standard foot in English poetry, not because exceedingly frequent inversions of it did not occur, nor because dactylic and anapestic innovations were not part of the very body of even the heavier epics, nor because runover lines did not frequently render the iambic-trochaic mêle of feet difficult of interpretation in favor of one or the other kinds as the predominant foot,—but because the stress of the accented syllable of the iambus seemed to bring more into prominence the sounds meant to be stressed than did that of the trochee. Hurst and Mackay (*op cit.*) found indeed that the iambus detained its ictus in the motor consciousness twice as long as its arsis, while the time relation of ictus and arsis in the trochee was only $3/2$ to 1.

The experiments carried on by Stetson¹⁸ and Bingham¹⁹ had effectually shown the advisability of employing some simple voluntary process as a basis for psycho-motor correlation. The method herein employed is practically the same as theirs. The voluntary process used was the tapping movement of the right index finger. This movement is exceedingly simple and natural, and soon tends toward automatism, leaving one's attention entirely free to be directed upon the stimulus. Very rarely did the finger movement return to consciousness after it had become automatic; when it did so, introspection showed a very unpleasant

¹⁸ "Rhythm and Rhyme," *Harvard Psych. Stud.*, Vol. I.

¹⁹ "Studies in Melody," *Harvard Psych. Stud.*, Vol. II.

and turgid state of consciousness; which state seems to be present usually when any chain of habitual responses is broken.

THE APPARATUS

The form of the apparatus was as follows: Upon two tables placed about two metres apart, revolving brass drums were fastened; over these drums passed a smoked paper belt; the driving mechanism was at one end, the record-taking device was at the other. The subject sat comfortably at the side of the table and laid his right arm on a flat wooden rest having a notch sufficiently long to avoid all possible interference with the index finger, which was left free to move throughout its entire natural range of flexion or extension. To have had the finger strike against some resisting surface would have prevented our detecting any slight variations which the stimuli produced and inasmuch, also, as the characteristic departures of the tapped strokes from the abscissa line were of great importance for most of the subjects, the lack of objective controls in the tapping was an obvious advantage.

The periodic movement of the finger was recorded as follows: the end of the finger was placed in an oilcloth cot which was used for all the experimental work without being changed, and from the cot ran a fine silk thread up over a small brass pulley (always kept well oiled) through a guide, and was fastened to a small aluminum marker of triangular shape. From the other end of the marker ran a small rubber band to an unright support. The point of the marker rested on the smoked ribbon, at a place on its surface quite close to the vertical axis of the drum, and so neatly was this whole apparatus constructed and so slight was the tension of the rubber band, that it was hardly perceptible to the subjects and did not interfere with the freedom and naturalness of the movement. The tension was not altered throughout the experiments. The thread and rubber band were renewed in duplicate at about equal intervals and thus the mechanical errors in the recording device were reduced to a minimum.

The smoked paper ribbon was driven by a gravity motor of sufficiently constant speed to reduce the error of inconstancy to

less than 1 per cent. Its rate was 1 cm. = 1.54 sec. The driving mechanism was enclosed in a $1\frac{1}{8}$ in. soft-pine box, lined with very heavy felt, and the only sound audible was an exceedingly faint, and not unpleasant whirr, which soon became accommodated and was never again noticed. A control string passed from the motor up over a pulley to the other end of the belt to where the experimenter sat, and thus the movements of the experimenter were very slight.

As the finger moved up and down while the ribbon revolved, tracings were made on the smoked surface and, since the pointer accurately recorded the full extent of finger movement as well as such qualitative differences as suddenness and quiverings in flexion and extension, the smoked paper ribbon translated much of the voluntary movement into visible terms.

No suggestions or illustrations were ever given as to rate or extent of finger movement; each subject was allowed to make his own pattern, and for this a little preliminary tapping was employed using empty 5-iambic lines. In recording the introspection, which was done without inserting a screen between subject and experimenter, great care was always taken to betray no sign that the introspection given was agreeable or not to the results sought after. At least, all conscious control of the matter was assiduously avoided.

The apparatus was arranged so that the subject sat facing the window, from which only a patch of sky was visible; the aspect was northerly, and there being little or no direct sunlight, the lighting of the room was fairly constant throughout the whole period of experimentation.

PRELIMINARY EXPERIMENTS

The first experiment to be tried with the above tapping device was a decasyllabic line made of five iambs, repeating la-mo. This line was repeated five times. The instructions ran as follows: "This is an experiment upon the psycho-motor effect of the sounds in poetry; while you recite the line, tap at each accented syllable; take your own time to do it, tap in a natural way, in as long or as short strokes as you please; say it in a clear voice

and then introspect upon the three factors of feeling-tone, sensations and imagery, if all three come; otherwise just give me the introspectional conscious content, much or little; it is the sounds and their effects which you are to attend to. I pull this string and start the motor; after that, whenever you are ready, recite and tap; the line is to be spoken and tapped five times; pause between the lines just enough to control the start of the next line; have you got the instructions in mind? are you ready? etc." This instruction was not repeated in toto at every hour's work to every subject; as much of it, however, as was deemed necessary from psychognostic reasons was repeated, in order to get the same 'set' for each group of experiments. Inasmuch as the motor field was so narrow, the tapping soon became automatic, and the instructions could be reduced to: "This is to be tapped as the others were,—on the accented syllable." And since most of the experiments were written out and the accents marked in red, this fact rendered full instructions obsolete.

La-mo was followed on the same day by two other experiments, la-bo and la-ro. All of the eight subjects found the la-ro pleasant; one subject, W., found la-mo unpleasant, and A. found la-bo unpleasant. In general, la-mo was found to have a "soft, smooth character," like the gentler sounds of nature; la-ro, on the other hand was said to represent the roar of waves and to have less personal reference than la-mo; while la-bo implied something insistent and was referred to as "trivial."

One cannot lay much importance upon the affect-motor correlations in these experiments, for the subjects had not yet become accustomed to the tapping; A. and W., for example, found it more convenient and natural (?) at first to represent the ictus by an up-stroke of the finger. The down stroke was suggested, and they attempted it, but for the first few weeks, at least, found that it was more difficult to employ it. The records, nevertheless, were measured with respect to the ictus, whether it had been functioned by an up or a down stroke. It seemed very curious that an accented syllable should be represented by means of the weaker of the two movements of the finger.

Of these three combinations, la-bo appears to have aroused the greatest feeling of energy. A. seemed to find it so; B. certainly declared it as such; L. and T. also indicated the same tendency. But B. moved his finger farther in the recitation of la-mo and la-ro than he did in the more "energetic" la-bo. So did L., while T. who found la-ro to represent "something substantial" employed the greatest force for that sound, and was consistent with respect to la-bo, which he called more active than la-mo. But this was all in the learning stage, and it is not surprising to find that practice increases the length of the tappings, on account of the greater familiarity and confidence with the work which it brings. The subjects were asked to rank these three experiments according to pleasantness, and the following scheme shows what relation degrees of pleasure have to motor discharge in this first group of experiments. (Descending pleasantness represented by A. B. C.)

Subject	(A Tapp.) Av.	(B. Tapp.) Av.	(C. Tapp.) Av.
A.	-ro 44.1 mm.	-mo 38.3 mm.	-bo 44.9 mm.
B.	-ro 78.1	-mo 83.5	-bo 76.2
F.	-ro 45.8	-mo 58.0	-bo 46.4
L.	-ro 51.8	-mo 66.7	-bo 50.7
N.	-ro 86.8	-bo 87.7	-mo 83.3
T.	-ro 76.0	-bo 73.6	-mo 62.6
W.	-ro 54.8	-mo 24.6	-bo 55.3
Z.	-ro 43.5	-mo 51.2	-bo 42.3

Three of the subjects, A., W., and Z., ascend in length of tappings as the feeling tone ascends. Three of them, B., L., and T., all give the medium stroke to the experiment they found in the middle degree of pleasantness but all three also ally the greatest degree of pleasure to the least amount of motor discharge. The other two, F., and N., show no correlation at all.

The next two experiments were the combinations de-ho, and ho-de (both long vowels). From graphing the objective results it appeared that ho-de produced on the average a greater motor output than did de-ho. Also the curve of the latter rises and falls,—from the first to the middle a rise, and from the middle to the end a descent; this was general for all the subjects: some reported a little exhilaration, strain and the like, but no feeling of fatigue, or exhaustion. The ho-de curve,

on the other hand, rises almost continuously from start to finish, with a remarkable rise on the fourth foot of the fifth group, and a no less striking descent on the last accented syllable of the series. But the last three groups show the same general tendency,—that of emphasizing the motor prominence of the fourth foot of the group. The first group of either, however, shows almost the same kind of form, which may be due to the persistence of the motor "set."

Three of the subjects, A., L., and T. preferred *ho-de*; in each case the tapped strokes were longer for the more pleasant; but in the former experiments, only one of them, A., showed this feature. All the other subjects, B., F., N., W., and Z. manifested a preference for *de-ho*; all but N, as mentioned above, tapped shorter strokes while reciting it. Four of the subjects found the vocal construction caused by the "-de" an unpleasant feature. But inasmuch as there was no objective standard of intensity or other vocal quale which was to be followed, the matter of constriction cannot be raised to a very high importance. One can say "*ho-de*" with countless degrees of energy and the like, and usually no subject intensified an unpleasant sensation; rather was the voice weakened and lowered to avoid it. On the same day, also as *de-ho* and *ho-de* were given, the combination *ra-fo* (both vowels long) was given. The explosive character of the *f* tended upon repetition to destroy the pleasantness with which it started out.

The graphings showed a remarkable steadiness of motor reaction for this combination until the last group of five iambs was reached.

The next two experiments were *de-sto*, and *sto-de* (vowels both long). Curiously enough, the differences in the amount of motor discharge did not appear until the fourth and fifth groups, and while the *ho-de* graph kept rising after the third group, and *de-ho* fell, here the case was altered completely; *de-sto* showed an ascent, but in the middle of the line only (!); but again, the accented *O* produced a slower reaction than did the *E*. One must remember, of course, that not only is the accented syllable different in each of these four experiments,

but also is the unaccented syllable. Furthermore, the subjects reported that not only did the iambic attempt to become a trochee, but the unaccented syllable also tended to demand an accent!

Correlating the feeling-tone with the motor discharge of these two experiments, we find that subjects A. and F. tapped longer strokes for the pleasant than for the unpleasant experiments; N., W., and Z. reversed this; L. tapped longer strokes for the unpleasant than for the indifferent, while B. and T. tapped longer strokes for the pleasant than for the neutral. A comparison of these results with those given previously shows very little constancy.

THE PSYCHO-MOTOR EFFECTS OF N

The next seven experiments were constructed to ascertain the effect of accented N; the unaccented syllable, "be" (short e) was chosen because it seemed to be about as explosive as N, and thus would be a good balance for it. The experiments were: be-ne (e short), be-ne (e long), be-ni (i short), be-ni (i long), be-na (a long), be-nu (u short) and be-nōo (oo long). N is also a much used sound in the language. Seeing that these experiments furnished a better body of material than any pairs or triads which had preceded, it was decided to correlate according to the mean, the mean variation, and the range. Introspectively, N appeared to arouse an attitude of negation. This group of experiments also appeared as the conjugation of a verb, and took on at once with most of the subjects a distinctly "oriental" character. The N dominated consciousness, in spite of the changing final vowel. The experiments were all given on the same day; which may also account for the following constancy in numerical results.

Subject	Rank list. Average of the tapplings for each subject.							Variation
	Be-nē	-nē	-nī	-nī	-nā	-nū	-nōo	
A.	b	b	c	c	b	b	b	2
B.	h	h	h	g	g	g	g	3
F.	e	e	e	d	e	d	e	2
L.	d	d	d	e	d	e	d	2
N.	g	g	g	h	h	h	h	3
T.	f	f	f	f	f	f	f	0
W.	c	c	b	b	c	c	c	2
Z.	a	a	a	a	a	a	a	0

If, however, we take the averages of the tappings for the pleasant, unpleasant and neutral experiments, no such harmony is manifest. As follows:

Subject	P	Average of		N	P U N arranged in order of magnitude
		U			
A.	52.9	53.3		51.4	U P N
B.	78.0	76.7		80.4	N P U
F.	62.9	62.4		65.0	N P U
L.	62.3	62.5		65.0	P U N
N.	78.5	80.8		—	U P —
T.	68.0	68.1		65.2	U P N
W.	53.8	—		—	— — —
Z.	46.0	49.1		—	U P —

But even if no judgments of unpleasantness or neutrality were made by some of the subjects, yet the above table shows that when such judgments were made, it was not at a time when the tappings were the longest; one is again at this place referred to Fere's "sensation et mouvement", *op. cit.* Where comparison is possible in these above citations, rarely did the pleasant feeling tone go with the longest tapped strokes. The balance hangs almost evenly between neutrality and unpleasantness in this respect.

The rank lists of the mean variations, hereafter denominated by M.V. and of the ranges, that is, the millimetric distance between the longest and the shortest tapped strokes, denominated later by Rnj, show no positive correlation. In this instance, also, the averages of the M.V. and of the Rnj. for the P., U., and N, experiments is hardly significant.

The graphs for these experiments showed that be-ně and be-nē are similar in their capacity to arouse equal amounts of motor discharge. The average difference is but 2mm. All things considered, the increase of motor output was fairly steady from start to finish. Benĩ and Be-nĩ showed a less increase from start to finish and in the third and fourth group of five iambs stood somewhat apart. There was a general rise in be-nũ, but be-nōō fell almost precipitously at the close. Be-nā tended to duplicate be-ně and be-nē. These differences can hardly be correlated with those of feeling tone, for the be-ně was found to be pleasant by 3 persons, Unp. by 4, and indifferent by one; be-nē, which followed it quite faithfully in the graph, was

chosen pleasant by 7, and Unp. by one. Likewise, be-nũ was found pleasant by two persons, Unp. by three, and yet this graph does not ascend at all like the other one or with so great an upward slant; moreover, be-nōō, which was chosen pleasant by all the subjects (including the 7 who chose be-nē as pleasant), did not produce the same kind of a graph in appearance as did be-nĩ. Furthermore, there was no report from the subjects that they felt the finger strokes getting longer or shorter in any such way as these graphs indicate they must have done. And every one of the subjects contributed to the increases and decreases. One can but conjecture then, that some of the neural currents find their way out of the central system along that motor channel which is already in use, without making their functional nature known to the introspective consciousness. It was unpleasant, also, for nearly all of the subjects to be aware of their lip and tongue movements; and while some of them actually did raise the pitch of their voices at the finish of be-nā and be-nĩ, yet they had no notion of it, much less of the fact that they were tapping in co-ordination with this general increase of effort. The only introspection they gave on this matter was "a feeling of difficulty" (*e.g.* with be-nĩ) and a "feeling of activity" etc. (*e.g.* with be-nĩ). That both of these should produce the same general increase of tapping is interesting.

THE EFFECT OF LONG OO

The next experiments were of the same general character. Ro (long o) was chosen as the unaccented foot, and the long accented vowel was oo (long). Both being long, open vowels, a good balance was expected. Furthermore, the long oo vanishes quite readily into a long o, preceded by R. Unlike the former group, which was devised to study the effect of accented N, this group intended to bring into prominence the mouth resonances, rather than the articulation pressure of the consonant N. The following consonants, in the following order, were prefixed to the accented long oo: B, M, V, TH (sonant), D, Z, SH, J, L, and G. As usual, the iambic decasyllabic line was employed, and repeated five times.

From the introspection given for these experiments it was found that the long vowels employed in them dominated the combinations and had a non-personal reference. Frequently the effect became soporific, and again, when the consciousness of facial expression involved while reciting them became observed, the subjects were inclined to call the emotion thus induced one of "supplication" or "complaint." None of the consonants attached to this vowel ever became at all "hard," or difficult to say.

The rank list for the mean of these experiments.

Experiment	Ro-boo	-moo	-voo	-thoo	-doo	-zoo	-shoo	-joo	-loo	-goo
Subject										
A.	d	e	e	e	f	d	e	d	e	f
B.	e	d	g	g	d	f	f	f	f	e
C.	i	i	i	i	i	i	i	i	i	i*
F.	f	f	c	d	e	e	d	e	d	d
L.	b	c	b	b	b	b	c	b	b	b
N.	g	h	f	f	h	g	g	g	h	g
T.	c	b	d	c	c	c	b	c	c	c
W.	h	g	h	h	g	h	h	h	g	h
Y.	a	a	a	a	a	a	a	a	a	a†

Comparing these ranks with those of the be-nī type of experiment and with only those subjects who took part in both, we find them showing the following divergences from a steady position:

Be-ni, etc.,A. 2, B. 3, F. 2, L. 2, N. 3, T. 0, W. 2.
 Ro-boo, etc.,A. 5, B. 6, F. 8, L. 2, N. 5, T. 3, W. 3.

The first group represented here contained 7 experiments, the second, 10. One can expect a wider latitude of variation in a greater quantity of material. F., alone seems to have increased the ratio of divergence more than would be expected. It was noticed, also, that the organic stirrings which some of these experiments, like, for example, Ro-thoo set up, was not shaken off by him (F.) until several of the subsequent experiments had been performed. Besides, -moo and -voo had disturbed his original position in the ranks, which was "f." He never afterwards regained it in this set of experiments.

The introspection for the above experiments contained many expressions of "feelings of activity," "struggles," "quiet states,"

*Subject C. now begins to tap the longest strokes of any and †Subject Y. remains in the lowest position. It is the rank of the other seven subjects, who varied the length of their tappings most and whose tappings are nearer alike in length which needs to be considered especially.

and so on. Let us compare these with the amounts of motor discharge in the tappings:

A. felt "-moo" to be easy, and "thoo" to be a struggle; and the M. for -moo is greater than for -thoo; again, in -loo, he felt activity, but the M. for -loo is not as high as it is for -shoo, -joo, and -goo, in each of which there were unpleasant mouth sensations. B. felt -joo to be the most energetic, and his M. for this is the highest of the series, 94.8; -thoo, which brought visual imagery of a dense crowd, was accompanied by a M. of 94.0; -zoo, with "openness," has an M. of 91.0; but while with th, "crowdedness" is correlated with 94.8 mm., "sultriness" in the imagery of -doo is correlated with only 77.6 mm. in the mean of the tappings.

C. shows some nice correlation between energetic and passive states in connection with -boo, -moo and -voo; but -loo is higher in the M. than -joo. F. gave the lowest of his M.'s to -voo and -thoo, which he found the most difficult to say, while in the sounds which brought a feeling of activity, he taps the longest strokes. L. does not seem to offer correlation either way. N. during states in which activity is felt, taps longer strokes than when some restraint is manifest; *c.f.* -voo, -doo, -zoo and -loo as compared with -boo, -thoo, and -joo. T. and Y. do not seem to furnish any definite correlations. W. taps variously for the energetic sounds, yet gives a M. of 99.8 to -zoo, which did not seem to appear energetic to him.

Thus the three factors of "free activity," "restraint" and "quiet ease" do not correlate with the amounts of motor discharge in any way as one might expect. Three classes of subjects are evidenced in the above records;—those who tend towards relaxation in the finger when they feel it in the imagery or in the utterance of the sounds, those who do the opposite, and those who vary throughout the experiments. But it is perhaps too early in the work to make any general statements.

Correlation of feeling-tone with motor discharge
Experiments: ro-boo.....ro-goo, as before

Subjects	Pl.	Unpl.	Neutral	
A.	83.6	84.2	84.9	N U P
B.	89.3	77.6	85.7	P N U
C.	103.1	108.8	109.2	N U P

F.	85.6	79.6	—	P U —
L.	61.4	64.2	63.0	U N P
N.	93.6	90.4	—	P U —
T.	85.5	76.1	—	P U —
W.	96.0	—	88.8	P N —
Y.	46.6	46.0	—	P U —

This seems to give a decidedly different sort of result from that of the Be-ni type of experiment revealed with respect to the length of the tappings during the pleasant experiments; but if the single experiments are taken into consideration, it will be found that while subjects A. L. T. and W. do tap the longest strokes for the most pleasant of the pleasant experiments, yet the other subjects do not do so; B. C. F. and N. show no preferences, while Y. taps the shortest. But this division of the subjects into classes does not run parallel with the above division into classes on the basis of motor output and feelings of restraint, activity or quiet ease. But until we come to a set of experiments in which each one of the subjects is represented in all three feeling tones, it is hardly fair to pit one set of results over against another to the detriment of either. It may well be that the continuance of pleasant states or of other kinds has its own special effect upon the motor resources.

Considering the three rank lists, M., M.V. and Rnj. together, find that the number of aberrations from a steady position is very great, and only the following remarks are appropriate:

1. Subjects C., F. and N., approach and sometimes maintain some degree of regularity in the Mean Variation and in the Range, yet only one of these, C., remained steady in the Mean rank list. Here, in the M.V., this subject has four f-positions and in the Rnj., three g-positions, with a general tendency to maintain them. Subject F. who had eight displacements in the Mean rank list, steadies himself with three h-positions in the M.V. rank list, and with three g-positions in the Rnj. rank list, but only in the latter does he tend toward making that letter his moorings. Subject N., with five displacements in the Mean rank list, shows here steadiness in the M.V. list, tending toward an a-position, and in the Rnj. list his tendency is toward maintaining the same position also. But Y, who was absolutely steady in

the Mean rank list, here shows only three h-positions in the M.V. and but three c-positions in the Rnj. rank list.

2. Most of the other subjects, who tended toward some steadiness in the Mean rank list, here are scattered up and down the scales in complete disorder.

Correlations were shown before between the feeling tone and the averages of all the tappings for the pleasant, unpleasant and neutral combinations. There follows a similar table, showing the correlation between the feeling tone and averages of all the mean variations and ranges of all the tappings during the various feeling tone states.

(Repeating the former correlations with the mean.)

Experiments: ro-boo.....ro-goo.

Subjects	Pleas.	Unpl.	Neut.	(Mean)	N U P
A. M.V.	3.1	3.4	2.4		U P N
Rnj.	18	19	12	"	U P N
B. M.V.	3.7	3.2	4.1		P N U
Rnj.	20	13	19	"	N P U
C. M.V.	4.5	3.7	2.9		P N U
Rnj.	19	24	16	"	U P N
F. M.V.	3.5	3.0	—		P U*
Rnj.	20	18	—	"	P U
L. M.V.	3.5	3.4	4.9		U N P
Rnj.	18	17	23	"	N P U
N. M.V.	2.2	2.9	—		P U
Rnj.	12	14	—	"	U P
T. M.V.	3.8	3.4	—		P U*
Rnj.	20	19	—	"	P U
W. M.V.	3.0	—	2.7		P N
Rnj.	16	—	17	"	P N
Y. M.V.	3.1	3.0			N P
Rnj.	17	22			P U

* Where only two kinds of affective judgments are made, of course the possibility of correlation is better, but even chance would give as good correlations as N., W., and Y. show.

The graphs for these experiments showed an entirely new character in the visible record of the average of the tapplings for all the subjects. With few exceptions, the rise is only initial, but not a great deal of importance is to be given to the first group of five iambics in any of the experiments, because no preliminary tapping was done by any of the subjects; they all began to tap and recite at the same time. The averages of the Be-ni type of experiment were all below 70 mm.; these are all above 77 mm.; evidently all the subjects got more familiar with the work. Indeed, all of them seem to have by this time passed the period of the "Anregung," as can be easily demonstrated from the tables which are to follow. It remains to be seen whether the subjects respond to the material of the experiment in such a way as to furnish correlations between feeling-tone and motor discharge in point of Mean, Mean variation and Range that will be of any service in determining the psycho-motor effect of the speech elements in poetry. Referring to the graphs again, it appears that the vowel OO swallows the consonants which precede it, and to produce in the drawings the visible effect of OO rather than of B, M, TH and so forth. It remains to be seen whether the other vowels to be experimented upon perform this same usurpative function or not. It will be remembered that ŌŌ dominated also the introspective consciousness in these experiments.

THE EFFECT OF LONG E

The next ten experiments were devised to exhibit the effect of long E. The unaccented syllable was "la" (given as the Italian A, but it immediately became the neutral vowel).

In general, the effect of "E" was to produce feelings of tension, and as a long vowel, it was thought to take decidedly less time than either O or OO. Some of the subjects tried to "put force into it," but did not succeed; it appeared to cause restraint, rather than the "expected sense of outward control." All of the subjects called its pitch very high and not at all like the effect of most words containing long E's. It also appeared to be more modified

by the consonants preceding it than were the vowels in the other previously given experiments.

From constructing the rank lists for the mean of the tappings for these experiments, one sees greater variation from a steady position than with either of the two previously given groups of experiments. As follows:

Be-ni	A. 2	B. 3	C. 3	F. 2	L. 2	N. 3	T. 0	W. 2	Y. 0
Ro-boo	5	6	8	8	2	5	3	3	0
-be	10	11	8	9	3	7	9	3	0

Should we ask whether the change in the rank for each subject denotes a change in the feeling tone, the answer is doubtfully given either way. Y. found all these experiments pleasant, and keeps the same rank, but this subject's tappings are way lower in length than any of the other subjects'. W., who finds the last nine of these experiments pleasant and who varies very little in his position in the ranks, may be said to be fairly constant, but subject B., who also found the last nine experiments pleasant, varies his position in the ranks more than any of the other subjects (11 points). L., who is quite steady, varies his position even when he finds consecutive experiments are equally pleasant or otherwise; while N., who finds the first eight experiments pleasant varies most during the first part of the rank list.

Let us examine once more the averages of the tappings with reference to feelings of activity, hindrance and the like. A. felt a strain while reciting -fe, and his average is low; -ke and -le, which were felt to be active, show high averages. C. found -ne more energetic than -le, but tapped shorter strokes for it; -ge he found to be "powerful," and his average tapping is the highest for this sound. But -che is also quite active, and yet the average of the tappings is low. He thought he was tapping very long strokes for -the, but he was mistaken. F. began to feel strain sensations with the recitation of -ne, and from this point on he taps longer strokes; he called -ke less free than -le, and taps longer strokes for the latter sound. When L. found -ke a "hard" sound, his tappings were lower. Usually, the more "harmonious states of mind" brought the lowest averages for N.'s tappings. But when W. felt the freest, his tappings were the longest. Sub-

jects A., F., N. and possibly W. seem to be keeping quite constant; they tap the longest strokes in the freely active states, and vice versa.

Correlation between feeling-tone and motor-discharge, with respect to the mean of all the experiments, grouped under the three degrees of affect, P., U., and N.

Subjects	Experiments: -be.....-ge.			
	Pl.	U	N	
A.	85.0	81.3	85.0	P N U
B.	83.0	—	87.4	N P
C.	93.1	85.6	86.6	U P N
F.	81.5	77.0	—	P U
L.	68.3	74.8	65.5	U P N
N.	88.5	—	90.2	N P
T.	79.3	76.2	78.0	P N U
W.	94.8	91.8	—	P U
Y.	50.8	—	—	

Comparing this with the correlations for the -boo experiments, we find F., L., T. and W. somewhat similar in their preferences, but the other subjects vary exceedingly. L., indeed is the only one giving three judgments who duplicates himself.

Of all the subjects, Y. appears the most constant all the way through. N.'s ranges rank fairly steadily, but the Mean is not constant. W. and L. represent the best averages, after Y. C., who varies much in the F.T. as the experiments proceed, also varies much in these rank lists, but other subjects do not correlate in the same way.

Correlation between feeling tone and the averages of all the M.V.'s and Rnj.'s for the various experiments (together with the previously given data for the Mean).

Subjects	Experiments: -be.....-ge.			(Mean)	
	Pleas.	Unpl.	Neut.		
A. M.V.	4.3	5.4	2.6	"	P N U
Rnj.	23	21	13		U P N
B. M.V.	4.1	—	3.0	"	P N
Rnj.	48	—	11		P N
C. M.V.	3.9	2.7	2.3	"	U P N
Rnj.	21	19	20		P U N
F. M.V.	3.9	3.2	—	"	P U
Rnj.	16	18	—		P U
L. M.V.	3.4	3.7	4.8	"	U P N
Rnj.	15	16	18		N U P
				"	N P

N. M.V.	2.3	2.1	—	“	P N
Rnj.	21	11	—		P N
T. M.V.	4.2	3.4	4.6	“	P N U
Rnj.	21	14	16		N P U
W. M.V.	3.6	3.5	—	“	P N U
Rnj.	23	21	—		P U
Y. M.V.	2.8	—	—		P U
Rnj.	14	—	—		P U

Here W. alone remains constant. All the rest vary almost as much as is possible with three permutable terms.

Something must be said now in regard to the last two sets of experiments in point of constancy in tapping during all the pleasant, unpleasant and neutral states. We observe that the final average of the mean, mean variation and the range do not adequately represent in most of the cases the general results. If one studies the variations from these averages, he will see that especially in the “pleasant” experiments, there is almost no confidence to be put in these figures as representative. It is not so much so in the case of the “unpleasant” experiments. Space does not permit a full review of this interesting point, but *in general, the pleasant states have more varied ways of representing themselves in the tapping than do the others.* The subjects frequently show that there is more variation from the mean of the “pleasant” tappings when there is no interruption in the affective tone as the list precedes, than when some other condition is manifest. This is very curious. And the objections that might be brought against any such method of experiment seem now to have plenty of reasons for their existence. Some might say that there should have been more careful judgments on the degrees of pleasure, to obtain a more accurate correlation, but it was deemed a very arbitrary matter to oblige the subjects to say “pleasure 1, 2, or 3” when they did not feel such a difference to be manifest.

Our next interest is in the graphs for these long E experiments. Ke, -ne, -ve, -me, and -le all start stronger than do the others, and also move straight across the page; while the others ascend fairly well together, but end in different degrees of strength.

The "scatter" of the first group of these graphs is greater in the second and third groups of iambics,—that of the others (the -be, -ge, -the, -che, and -fe) is prominent only in the last two groups. One might say that L, M, N, and V, being pleasant, had here shown positive correlation between pleasantness and motor discharge, since they are all lower than those of the most unpleasant experiments, those employing K, G, B, and TH, but -ke is in the group which shows the less motor discharge. Also -che, which everybody found pleasant, is next to the very topmost graph of the lot, which means that its average is to be placed with the other pleasant experiments. Ranking the experiments in a descending order of pleasantness, below which are the final averages of all the tappings, it can be shown, that with the exception

Exp.	-che	-le	-ne	-me	-ve	-fe	-the	-ke	-ge	-be
Av.	80.2	85.8	82.8	83.2	82.0	78.6	81.2	86.6*	78.4	78.4

of -ke*, the correlation runs positive with the pleasantness. As for -ke, it was chosen as indifferent by two of the subjects. But this apparent correlation may be due to the tapping of but one subject, W., who gave the longer tappings to the pleasant combinations.

The next experiments to be tried were devised with a view of discovering the effect of the "aw" sound. They were five in number. The unaccented syllable was De, (long E). Aw was preceded by these consonants: f, th, t, n, and g.

Introspectively it proved to appear pitched very low, to have a tendency to become nasal; not very musical, but arousing more organic stir than any sound previously used.

The rank list for the Mean of these experiments is, with symbols P, U, N indicating the feeling tone, as follows:

Experiment:	-faw	-thaw	-taw	-naw	-gaw
Subject					
A.	d-P	c-U	c-P	c-P	c-P
B.	f-P	d-U	f-P	f-P	h-P
C.	g-P	g-U	e-P	h-U	i-N
F.	c-N	e-P	e-P	d-U	e-N
L.	b-P	b-U	b-P	b-U	b-N
N.	h-P	h-P	g-P	g-P	f-P
T.	e-P	f-P	d-P	e-N	d-N
W.	i-N	i-U	h-P	i-P	g-N
Y.	a-N	a-N	a-N	a-N	a-N

Notice here that subject Y. would hold position -a- in the ranks, regardless of feeling tone; and that L., whose position in the ranks is -b- in these experiments, shows here lower tapping averages than he has for some time. It is hardly possible to make any statement about these ranks, except to say that the subjects are all more anchored to one position than in the case of either the Ro-boo or the La-be experiments.

In regard to feelings of effort and activity, C. described -naw as requiring effort, but the average for this experiment is almost the lowest of the series. -Taw, which gave a feeling of activity, is correspondingly high, but -thaw, which affected him the same way, fails to show in these averages; -faw, also requiring effort, is parallel in effect to -naw. The other subjects do not furnish enough examples to make correlation exact.

Grouping the above results according to feeling tone, and taking their averages, we obtain:

Subjects	P.	U.	N	
A.	64.9	66.7	—	U P
B.	80.9	73.6	—	P U
C.	88.6	85.3	97.8	N P U
F.	76.4	71.3	70.5	P U N
L.	57.8	55.0	58.0	N P U
N.	86.6	—	—	— — —
T.	75.0	—	73.5	P N —
W.	90.6	97.1	87.2	U P N
Y.	28.9	—	—	— — —

which, as results along this line, are not parallel with any that have been obtained before.

The rank lists for the M.V. and the Rnj. show that of all the subjects, only W. and Y. keep some sort of anchorage in them; the rest vary indiscriminately.

Grouping (and averaging) all the Means, Mean-variations and Ranges according to feeling tone, we obtain the following:

(Order of greatest to least)		
Subject		
A. M.	U	P
M.V.	U	P
Rnj.	P	U

B. (as above)	P U P U P U
C.	N P U P N U P N U
F.	P U N N U P N P U
L.	N P U P U N N P U
N.	all P
T.	P N P N P N
W.	U P N P U N U P N
Y.	all N

From the graphs for these experiments it appears that -gaw ascends steadily; -ge, in the preceding series, on the other hand, maintained a horizontal position. -Naw and -ne are likewise opposite in tendency, indicating some comparison in regard to these consonants. But -faw and -fe show the very opposite traits, as well as do -thaw and -the. One is tempted to correlate with the articulation-character of these consonants, but the amount of experimentation is as yet too meager. However, one thing more may be noticed, and that is that all of these -aw experiments but one, namely -naw, show in their final averages that the vowel "aw" tends to swallow up the consonants, in a way that the vowel "e" never did. Time did not permit any further experimentation with this vowel sound; furthermore, it is not a very important one in the tables of sound frequencies for English poetry. For equal bulks of material, nevertheless, and for those consonants which were used alike before accented -aw and -e, it is not idle to point to these results as showing something quite significant in the psycho-motor effect of the speech elements of poetry. Any one can see that the whole matter is one of amazing

complexity; later results may induce some sort of generalization of a specific character, but whether pro or con the matter of vocal valences, cannot be foretold at this time.

EXPERIMENTS UPON THE FOUR MOST USED LONG VOWELS IN ENGLISH POETRY: A, E, I, O

We next undertook an extended study of the psycho-motor effect of the long vowels A, O, I and E. Ten subjects took part in the experiments.

The experimental material was made on this plan: The unaccented syllable was "la" (neutral vowel), and the various consonants were prefixed to each of the above vowels to make such combinations as "La-BA," "La-DA," "La-CHE," etc. there were twenty-four experiments on each vowel, which at the same time were experiments on each of the consonants employed; thus we had four experiments in which the consonant B was used, and so on for all the series. The experiments were all given to each of the subjects in the same order, at the rate of about eight or ten an hour.

The last two experiments in each series of twenty-four are slightly different from the rest; in the tables presented later they are called A, A₂, O, O₂, etc. The twenty-third experiment in each series, A, O, I, E, consisted simply in reciting the open vowel five times in a group and for five groups, filling in the unaccented syllable subjectively. Experiment number twenty-four in each group is a line of verse in which all the accented vowels are the same, thus: A₂ is the line, "The gray and rainy April makes the May." O₂ is "The homeless ocean moaning o'er the shoal"; I₂ is, "The dying fire lights the silent sky," and E₂ is "And dreaming seem to hear the weary sea." No such lines exist in poetry, but they served the purpose in hand.

It was found by introspection that the characteristic thing about the long A was its "flat and uninteresting" quality. It was by no means energetic, and when liked, it was termed "soft and quiet"; vocally it was felt to be directed downwards rather than upwards. As far as the vowel-vanish is concerned, it was so little noticed by the subjects that we need not mention it; of course

the repetition of the same iambic foot brought it so closely into contact with L in the unaccented syllable, as almost to nullify the effect of the vanish.

One rather remarkable thing was noticed in the numerical results for the A₂ experiments: The mean of the tappings for every subject in this experiment drops below what it was for the previous experiment, A; with most of the subjects, also, it is lower than their average for all the other A experiments. Thus an influx of consonants, to say nothing of meanings, tended to reduce the lengths of the tappings. Changes in the apperceptive consciousness appear to induce changes in the motor setting.

O, from the introspection given upon the experiments concerned with this vowel, was more easily said than A, directed from the mouth more horizontally, more of an object of the esthetic consciousness, and more associated with the wind and water sounds of nature than the preceding one. Consciousness had more play with regard to O than A,—one could inspect the fringes and return to the focus, or maintain disparate foci quite easily during its recitation.

The character of the long I was found to be considerably more intense and forceful than that of A or O. Also the diphthongal character was very poorly concealed under the constant recurrence of the unaccented consonant. But I is a true diphthong and the introspection thus faithfully gives a prominent place both to the E-vanish and to the Italian A with which it begins. Its pitch seemed at once higher, its utterance less smooth, and the mouth movement more conscious than that of the preceding vowels; the drop and lift of the lower jaw was ever consciously prominent. It was frequently remarked that this vowel had very little connection with feelings of personality; the labial consonants had very much more to do with one's self than did the other consonants, and all felt much more intimate than did any of the vowels.

E was the most intense of all the vowels, feelings of strain at once appearing; but it was also more easily controlled by the muscles of the vocal apparatus than was I. Not so resonant as

the O, but it had far more "color" than the A. Reference was always external, the word "he" appearing to be thoroughly onomatopoeic. The tense condition of the mouth during its utterance often gave a feeling of weariness, as the position of the cheeks, lips and jaws is more rigid than in the case of the other vowels experimented upon.

If one should ask how these four vowels stand in the order of pleasantness, the answer is that O was chosen pleasant 126 times out of 240 judgments, I 123, E 120, and A 119 times. The consonants were preferred in the following order: R (28 out of forty judgments), L 27, N 27, V 25, M 24, B 24, D 23, Z 22, Ch 21, F 20, P 19, W 19, J 18 K 18, S 18, T 18, Th 17, St 17, H 15, Q 15, G 14, and Sh 12. One is referred in this connection to an article in the *American Journal of Psychology*, 1912, by Louise Roblee and M. F. Washburn, on the "Affective Values of Articulate Sounds," in which quite similar results are brought forth; the judgments of pleasure and displeasure were in general confined to the final consonants and vowels, and many more sounds were used by these experimenters than we have employed in the above experiments. But that S and I are quite natural in character, as the above-mentioned article indicates, we have not found to be the case in our own work. I was very insistent, and S became the basis for more unpleasant judgments in the transmutations than any other single sound in the language.

If we compare the consonants in the order of their pleasantness with their order of frequency, as given in the introductory paragraphs, it will be seen that the two orders do not entirely correspond; nevertheless, it is plain that the pleasanter of the sounds, as found in the brief sampling of the consonants, are those which occupy the positions of higher frequency; had all of the consonants been combined with all the vowels, the discrepancies might have been less. Three factors seem to militate against pleasantness in the pronunciation of a consonant: breathiness, vigorous movement of the lips, and the employment of the ends of the tongue in articulation.

A correlation between feeling tone and motor discharge was

found in the following way: If one arranges the averages of all the tapings for each of the experiments upon any one of the vowels in the descending order of motor output, and places side by side the same twenty-four experiments arranged in the ascending or descending order of pleasantness, it will be seen that in the case of the A-experiments that the more unpleasant were correlated with the greater expenditure of motor energy and vice versa. So with the other three vowels, the O, I, and E. This is exactly in line with what was found in the case of most of the earlier experiments in this investigation. Differences in one to one correspondence appear, however in the case of each of these vowels: with the long A, there are seven such correspondences; with O, there are eleven; with I, but two, and with E, five. The average displacement for the others is with the A, nearly nine points; with O, eleven; with I, eight; and with E, nine. It was also to be learned that the explosive consonants aroused the motor consciousness more than the softer and more liquid sounds. Besides, those sounds requiring the more facial movement while uttering them arouse the more general somatic activity.

Differences in the time taken to recite these experiments were not to be correlated with either of the above factors of affection or motor output; it is true that the more explosive sounds tend to be said very quickly, perhaps indeed, because many of the subjects tried to say them quickly to get done with them. But the liquids also went quickly, because they blended well together in the combinations,—indeed the whole line of five iambics often went like one ten-syllable foot, according to the introspective report.

As typical of the numerical results of these simple vowel and consonant experiments we next present the averages of the tapings by each subject together with the mean variation and the range, and also the rank lists for the above results in the case of the long O experiments. It will be noticed that most of the subjects change their position in these rank lists quite frequently: this will not mean that there was a corresponding change in feeling tone, but only in motor settings and motor arousal. With the

vowel, O, however, less variations from average position occurred in the case of each subject. The character of O from the introspective report is an interesting corollary to this fact: O was the most pleasant of the four vowels, and the play of consciousness about it was greatest on the side of introspection, but apparently not as regards the motory end of the matter.

The mean of the tappings for the long O experiments follows:

Subject	-Bo	-Do	-Fo	-Go	-Ho	-Jo
A.	86.2	85.3	92.4	90.5	88.2	80.7
B.	94.8	93.6	79.7	81.6	81.3	80.8
C.	110.0	106.3	105.1	105.6	105.1	104.5
D.	90.2	84.6	88.4	83.2	93.9	81.2
F.	90.2	96.8	96.7	92.6	92.2	93.8
K.	41.6	47.6	51.6	53.4	54.5	44.7
L.	77.6	79.0	71.4	62.1	62.5	67.5
M.	89.2	91.2	91.5	91.5	90.3	95.0
P.	126.5	125.2	115.4	120.8	120.4	117.6
S.	103.7	102.4	98.8	105.8	108.0	109.8
	-Ko	-Lo	-Mo	-No	-Po	-Qo
A.	68.1	80.5	79.7	65.0	91.3	88.6
B.	89.5	64.6	84.1	92.7	88.7	83.4
C.	103.2	99.6	101.7	111.5	107.1	111.1
D.	92.7	101.5	97.8	96.6	98.5	90.7
F.	94.8	87.8	90.6	89.5	82.2	90.2
K.	43.9	35.9	30.1	25.2	44.0	37.3
L.	71.8	70.9	65.3	66.0	72.2	67.5
M.	91.5	93.7	94.0	90.7	92.2	98.0
P.	116.1	117.8	115.4	121.0	124.1	127.8
S.	108.3	104.5	108.5	112.2	107.4	107.6
	-Ro	-So	-To	-Vo	-Wo	-Zo
A.	81.2	84.2	83.3	88.1	83.7	87.1
B.	95.0	91.6	91.1	89.3	95.0	91.8
C.	109.0	109.6	105.2	101.4	102.8	106.8
D.	94.4	88.0	91.2	95.9	96.3	96.0
F.	86.6	88.9	87.4	86.7	79.8	83.2
K.	67.5	55.7	37.2	42.1	44.9	42.8
L.	68.0	72.0	74.9	77.4	63.8	74.0
M.	98.9	88.8	92.8	90.8	90.7	91.7
P.	117.3	122.2	118.4	124.4	124.8	125.4
S.	111.9	104.4	110.7	113.2	113.6	113.7
	-Cho	-Sho	-Sto	-Tho	-O-	-O2-
A.	84.5	75.1	86.1	75.8	75.0	74.6
B.	77.4	81.8	86.4	92.6	82.7	101.4
C.	105.9	107.5	105.5	100.2	106.7	97.4
D.	93.3	93.7	93.5	94.7	102.0	101.8
F.	96.8	97.8	93.8	84.8	93.8	95.2
K.	44.5	49.2	31.1	39.8	53.8	45.7
L.	74.1	70.0	78.8	73.1	58.3	71.8
M.	96.3	94.0	103.4	96.0	97.4	95.4
P.	117.8	118.9	122.7	125.4	121.1	124.2
S.	117.4	118.5	118.0	115.5	120.5	125.6

The rank list for the Mean: La-Bo, etc.

Subject	B	D	F	G	H	J	K	L	M	N	P	Q
A.....	c	e	f	e	d	c	b	d	c	b	e	d
B.....	g	f	c	c	c	d	d	c	d	f	d	c
C.....	i	i	i	h	h	h	h	g	h	h	h	i
D.....	e	d	d	d	g	e	f	h	g	g	g	f
F.....	f	g	g	g	f	f	g	e	e	d	c	e
K.....	a	a	a	a	a	a	a	a	a	a	a	a
L.....	b	b	b	b	b	b	c	b	b	c	b	b
M.....	d	c	e	f	e	g	e	f	f	e	f	g
P.....	j	j	j	j	j	j	j	j	j	j	j	j
S.....	h	h	h	i	i	i	i	i	i	i	i	h

Subject	R	S	T	V	W	Z	CH	SH	ST	TH	O	O2
A.....	c	c	c	d	d	d	d	c	c	c	c	c
B.....	f	g	e	e	f	f	c	d	d	e	d	g
C.....	h	i	h	h	h	h	h	h	h	h	h	f
D.....	e	d	f	g	g	g	e	e	e	f	g	h
F.....	d	f	d	c	c	c	g	g	d	d	e	d
K.....	a	a	a	a	a	a	a	a	a	a	a	a
L.....	b	b	b	b	b	b	b	b	b	b	b	b
M.....	g	e	g	f	e	e	f	f	g	g	f	e
P.....	j	j	j	j	j	j	j	j	j	j	j	j
S.....	i	h	i	i	i	i	i	i	i	i	i	i

The mean variations for these experiments: La-Bo, etc.

Subject	Bo	Do	Fo	Go	Ho	Jo	Ko	Lo
A.....	4.2	7.1	3.7	5.0	3.5	3.6	6.7	2.6
B.....	4.6	3.2	3.1	3.1	3.8	4.8	7.2	4.7
C.....	3.7	2.4	2.1	2.4	3.1	3.3	2.7	2.8
D.....	2.1	5.6	2.6	5.2	1.8	5.0	2.8	2.2
F.....	3.8	3.3	3.0	3.3	5.6	4.3	3.4	5.5
K.....	4.1	4.9	4.2	3.4	4.1	4.0	2.9	4.8
L.....	2.8	2.5	4.1	4.8	5.5	4.5	5.6	3.8
M.....	3.0	1.6	2.8	2.2	2.3	2.4	2.4	3.4
P.....	1.9	2.1	5.0	3.0	2.2	3.4	3.8	3.8

Subject	Mo	No	Po	Qo	Ro	So	To	Vo
A.....	3.3	4.0	2.8	4.9	5.7	3.2	4.8	5.3
B.....	4.9	4.3	7.3	5.2	4.5	5.8	5.1	7.0
C.....	3.1	2.8	3.2	2.9	2.8	3.3	3.2	2.4
D.....	1.4	2.2	2.9	3.2	2.5	3.6	1.8	3.9
F.....	3.2	3.8	6.2	3.9	3.6	3.6	3.9	3.6
K.....	4.4	3.7	3.8	4.8	5.6	4.3	5.4	4.4
L.....	3.5	4.1	2.3	4.1	2.7	3.1	6.0	3.8
M.....	2.4	4.2	3.3	4.0	2.6	2.9	3.4	4.2
P.....	3.8	3.7	5.9	2.5	1.8	2.4	2.5	2.5
S.....	2.6	1.7	4.0	2.6	2.2	4.6	4.1	2.5

Subject	Wo	Zo	Cho	Sho	Sto	Tho	O	O2
A.....	4.1	4.1	5.4	7.1	5.2	4.1	4.2	4.1
B.....	4.8	5.0	4.1	5.5	6.0	5.8	4.1	4.6
C.....	2.7	3.7	3.0	3.3	2.5	2.2	3.0	2.8
D.....	2.8	3.9	2.1	1.6	2.6	3.5	1.6	2.6
F.....	3.0	4.0	3.2	2.7	2.9	4.7	1.9	3.8
K.....	4.2	5.8	5.9	3.2	4.7	5.2	4.7	5.1
L.....	4.3	4.3	4.8	5.6	4.5	5.4	5.7	5.8
M.....	2.6	3.2	3.6	3.9	2.8	5.5	2.7	3.7
P.....	2.3	1.2	2.0	2.9	2.9	1.2	2.1	1.9
S.....	3.1	2.7	3.3	3.1	4.1	4.4	3.6	2.9

The rank list for these mean variations: La-Bo, etc.

Subject.....	B	D	F	G	H	J	K	L	M	N	P	Q
A.	h	j	g	i	f	e	h	b	f	g	b	i
B.	i	e	e	e	g	i	i	h	j	j	j	j
C.	e	c	a	b	e	c	b	c	d	c	d	c
D.	b	i	b	j	a	j	c	a	a	b	c	d
F.	f	f	d	f	j	g	f	j	e	f	i	e
K.	g	h	i	g	h	f	e	i	i	e	f	h
L.	c	d	h	h	i	h	j	f	g	h	a	g
M.	d	a	c	a	c	b	a	d	b	i	e	f
P.	a	b	j	c	b	d	g	e	h	d	h	a
S.	j	g	f	d	d	a	d	g	c	a	g	b

Subject	R	S	T	V	W	Z	CH	SH	ST	TH	O	O ₂
A.	j	d	g	i	g	g	j	i	i	g	d	h
B.	h	j	h	j	j	h	h	j	g	i	j	g
C.	f	e	c	a	c	c	f	a	b	d	b	e
D.	c	f	a	f	d	b	a	b	b	e	c	a
F.	g	g	e	d	e	f	b	e	d	f	f	b
K.	i	h	i	h	h	j	e	h	j	j	g	i
L.	e	c	j	e	i	i	i	g	h	h	h	j
M.	d	b	d	g	b	e	g	d	f	c	i	d
P.	a	a	b	a	a	a	c	c	a	a	a	c
S.	b	i	f	c	f	d	d	f	e	b	e	f

The rank list for the ranges: La-Bo, etc.

Subject	Bo	Do	Fo	Go	Ho	Jo	Ko	Lo
A.	20	32	21	26	16	16	35	12
B.	24	14	18	16	17	20	27	25
C.	18	15	9	14	15	17	16	14
D.	11	28	12	30	12	22	20	11
F.	18	18	15	22	23	18	21	28
K.	18	22	16	19	18	23	29	21
L.	15	13	19	20	21	19	25	17
M.	14	9	13	10	10	11	16	16
P.	8	10	20	12	11	21	12	22
S.	19	22	24	18	20	8	15	26

Subject	Mo	No	Po	Qo	Ro	So	To	Vo
A.	23	23	15	23	22	15	29	25
B.	30	21	26	28	23	24	39	28
C.	11	15	14	15	11	23	17	14
D.	9	12	13	16	13	17	12	19
F.	24	19	28	17	24	13	20	18
K.	21	20	19	29	20	25	25	27
L.	18	16	21	24	14	18	27	22
M.	12	22	16	21	21	12	22	20
P.	19	18	30	11	12	21	14	17
S.	10	9	27	22	9	16	18	12

Subject	Wo	Zo	Cho	Sho	Sto	Tho	O	O ₂
A.	25	20	19	31	25	19	21	22
B.	32	21	23	25	30	30	18	26
C.	19	15	13	13	11	11	17	12
D.	13	12	11	7	15	17	7	10
F.	12	18	15	17	20	24	11	17
K.	28	28	26	12	18	22	21	23
L.	22	16	21	37	22	18	27	18
M.	14	17	18	19	21	23	19	21
P.	18	7	9	18	19	7	16	11
S.	20	14	14	11	24	33	20	20

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The rank list for the ranges: La-Bo, etc.												
Subject	B	D	F	G	H	J	K	L	M	N	P	Q
A.....	i	j	i	i	e	c	j	b	h	j	c	g
B.....	j	d	f	d	f	g	h	h	j	h	g	i
C.....	e	e	a	c	d	d	d	c	c	c	b	b
D.....	b	i	b	j	c	i	e	a	a	b	a	c
F.....	f	f	d	h	j	e	f	j	i	f	i	d
K.....	g	h	e	f	g	j	i	f	g	g	e	j
L.....	d	c	g	g	i	f	g	e	e	d	f	h
M.....	c	a	c	a	a	b	c	d	d	i	d	e
P.....	a	b	h	b	b	h	a	g	f	e	j	a
S.....	h	g	j	e	h	a	b	i	a	a	h	f

Subject	R	S	T	V	W	Z	CH	SH	ST	TH	O	O ₂
A.....	h	c	i	h	h	h	g	i	i	e	i	h
B.....	i	i	j	j	j	i	i	h	j	i	e	j
C.....	b	h	c	b	e	d	c	d	a	b	a	c
D.....	d	e	a	e	b	b	b	a	b	c	a	a
F.....	j	b	e	d	a	g	e	e	e	h	b	d
K.....	f	j	g	i	i	j	j	c	c	f	h	i
L.....	e	f	h	g	g	e	h	j	g	d	j	e
M.....	g	a	f	f	c	f	f	g	f	g	f	g
P.....	c	g	b	c	d	a	a	f	d	a	c	b
S.....	a	d	d	a	f	c	d	b	h	j	g	f

In measuring the ranges, it often happened that two or three subjects could have had the same position; re-measuring, however, or allotting to the subjects that position which they had previously tended to maintain, obviated the difficulty; for example, where subjects A. and B. were equally set for the position C in the rank lists, but had previously maintained positions B and C respectively, we assigned to them positions B and C, in order both to have ten positions, and to give each of them the benefit of the doubt. With differences of tenths of a millimeter as the basis for many of the correlations, it was not always easy to determine the exact status of affairs for any one subject with respect to another better than by the above method.

If one is again asked what changes of position in the rank list for the Mean denote, or even what changes in the average of the tapplings denote, we are somewhat at loss to give a fully satisfactory answer; it is not due to a change in feeling tone so much as it is due to various manifestations of the motor consciousness during the continuance of the same feeling state. As was previously noticed in the first year's work, it is usually

quite a while after the onset of a new feeling state, that a change takes place in the motor manifestations. And insofar as we correlate with the introspective report as a basis, we find that the mean variation of the tappings made during pleasant states is greater than the mean variation of the tappings made during unpleasant or neutral states; thus pleasure is manifested, at least in this experiment, by more varied expressive means than are the other affective states of consciousness. The introspection in connection with the pleasant experiments is richer, the associative functions are more operative, and the general bodily and mental condition is more indicative of ever new and varied manifestations in those states in which fine esthetic feelings are present than in those which appear to indicate the presence of cloggings, inhibitions and mutually antagonistic impulses.

Graphing these experiments revealed the following characteristic differences between the vowels:

The ascending order of motor output followed the series as presented, A, O, I and E. This may, however, be due to practise alone. But within any group of experiments other differences are quite significant, especially if compared with the introspection as given above; the O-graphs showed the least scatter, the E and I the most. E and I also march straight across the page, while A shows an "Anregung" incessantly throughout the series. E and I are also spoken in a shorter time than are O and A, and besides, the O-graphs are all indicative of the fact that this vowel was spoken in more nearly the same time even though preceded by the various consonants than were the E and I. Here, in the case of O, steadiness of motor discharge, as evidenced by the fact that the vowel tends to swallow the consonants which precede it, is correlated with steadiness and evenness of introspectional content and attitude; with E and I, on the other hand, the exact opposite is the case. The number of factors involved is many, and the final result may perhaps be tentatively stated as follows: Quickness of utterance is correlated with greater motor output; strain in the vocal apparatus with unevenness of motor output; ease with which the vowel is spoken

dominating the strain-effect of the consonants; and a negative correlation between unevenness (though unfelt) in the motor output, and also amount of such output and the pleasantness as aroused in the introspectional conscious content.

From a different graphing of these experiments, four in a group, on the basis of consonants preceding the vowels, where in each group of four drawings, one finds those graphs together which show the differences between the four vowels under the influence of the same initial accented consonant, we found that in nearly all the cases the A graph is the lowest; frequently very much the lowest, while again, the O, E, and I graphs exchange positions of height and extent to some considerable degree. But this is quite natural,—if the O had been *by far* the pleasantest vowel, or the R *by far* the pleasantest consonant, we might have expected the R and O graphs to appear unique and different from the others, but the vowels are almost equally pleasant, a difference of but seven judgments of agreeability separating the O and the A (the extremes), and the consonants grade very gently from the most to the least agreeable. So it is perhaps correct to say that the different graphs represent the matter not so much from the vowel side as from the consonant side when we compare the graphs for any one vowel together but that comparing one of these large groups with another, we have vowel differences rather than consonant differences before us.

The introspection revealed the fact that entirely different states of mind were aroused according to changes in the direction of the attention; instructions were given to neglect the physical sensations and to think of the sounds as much as possible, in order to have constant conditions for all the subjects. But this does not seem to have worked very satisfactorily in many of the above cases; frequently, indeed, mixed feelings were reported; the subjects would say: "The sounds are not unpleasant, but I do not like to say them"; or, "The sounds as heard are all right, but the everlasting mouth movement is exceedingly hard to keep out of the focus of consciousness." Absolute restraint was impossible; it would also have been quite unwise, for we were study-

ing the motor as well as the introspective consciousness and to find out just what happened in apparent conflicts between the two, especially on the side of the affections, was considered just as valuable as anything else. It was thought better to let things take pretty much their own course in the matter rather than to be too severely restrictive. But that the introspection was not universally given on the same elements in consciousness is at once evident; whether it could be, whether one can abstract one element and keep it abstracted throughout the series is very doubtful indeed. And yet, when we compare the amounts of motor discharge for the different subjects, the question comes up: "What was it that was called pleasant or unpleasant?" Well, the only thing to say is that the whole experience extended toward this or that type of affective tone, and that is about all that can be said. And if that is insufficient, then some other method must be devised to experiment upon these simple vowel and consonant combinations than we have employed. One will also notice that the subjects talked about some of the combinations having a higher pitch than others,—unless the pitch was changed, subconsciously, of course, to relieve the uniformity, this is quite incomprehensible; surely the vowel A does not take a different pitch in connection with some of the consonants than it does with the others, and if it seemed to, it is not unlikely that this was an illusion due to the greater intensity required to enunciate the explosive consonants. And as there was no uniformity on the judgments of pitch, even among the two or three subjects who made them, it is hardly possible that the pitch judgments indicate anything objective.

One final point also needs to be emphasized; which is that the tendency to make words out of these meaningless experiments was super-strong with nearly all of the subjects. As one subject said in regard to the transmogrifications: "It tantalizes me dreadfully because the words I get out of them have such disjunctive meanings." So that some severe critic might call this whole work, "An experiment in the delayed associations of misspelled words." But following such caustic criticism, let such

a person suggest some better way than we have used to experiment on the psycho-physiologics of the sounds of the language, and thus help us out of the dilemma. We admit right at the start that the whole realm of psychological esthetics seems to be constituted chiefly by its difficulties.

SIMPLE EXPERIMENTS CONSTRUCTED FROM THE TABULATIONS OF SOUND FREQUENCY IN ENGLISH POETRY

In connection with the next two sets of experiments reference must be made to the previously mentioned tabulations of sound frequency in the poets. If one arranges these percentages in order of magnitude for each one of the poets, it will be noticed that certain sounds are almost equally prominent for all of them, especially in the unaccented lists; and here we refer to the short U, I and A. Of the accented sounds, the consonants, rather than the vowels appear to be common property, inasmuch as R, T, D, L, S and M usually stand at the head of the lists.

The next twenty-seven experiments were devised to show the effect of the most prominent of these accented and unaccented sounds. They nearly all contain two unaccented and three accented letters. But these combinations, unlike those which have hitherto been employed, usually end with a consonant, L, N, D and T predominating. Thus the body of sound produced by their utterance is something more solid than we have had before; and the organs of articulation exercise more control than they did in the case of the long, open vowels.

No single poet's preference for certain sounds is especially represented in these combinations; the whole twenty-seven of them merely exhibit the most used accented and unaccented sounds of English poetry "ueberhaupt." The introspections for these experiments, which were given in the following order, is of interest:

I. Ne-rol. (Iambic foot, vowels both short; repeated five times in succession for each of the five groups.)

Implies the joys of rustic work and pleasure; visual imagery of the fields in summer. Soft and musical; suggests rapidity of movement; imagery of some

May morning. Soft, drawn-out thing; not very active nor deep, but it has body. Very musical and easy to say; sounds like the ringing of a bell; slightly monotonous, but not dull.

II. Un-ral(e). (As above, metrically and in groups; short "u," long "a".)

"R" the best thing about it; seems slightly inharmonious and perturbing; no definite imagery. Not energetic; couldn't keep the word "unreal" out of mind. "Ral" gives a feeling of contraction; seems inefficient; thinks of the pattering of hail or of big water drops.

III. Id-rel. (Vowels both short.)

Sounds have a bell-like quality; seems to refer to some celebration. Hard to keep the two syllables apart. Became "id-well," "did-well"; dislikes the jump from the first syllable to the second. Musical, hopeful sound; keeps ascending in pitch.

IV. Ri-tin(e). (First "i" short; second, long.)

Visualizes self on the sea shore on a warm, summer day; feels the heat and his own body distinctly. Makes him frown. Seems narrowly concentrated in space. Musical; in major key; encouraging; calls up the word "time." Emphatic, but monotonous; gets nowhere.

V. Tu-lin. (Both vowels short.)

Energetic and poetic; visualized the sea; heard the wind and the sound of the breakers. Very easy and pretty sound to make; suggests a light, fleet movement. Seems rapid; "tu" is light; "lin" heavy; good combination of sounds; very easy to coördinate finger and voice. Soothing and quieting; a lullaby; the alternation of the vowels is charming.

VI. Ti-ren. (Both vowels short.)

Sharp and concise and easy to produce; but the "n" seems to negate the expected climactic character of it. The superficial gloominess of a rainy, indoor day implied; not very "deep" sound; visual imagery dark gray. Couldn't keep track of the counting. Forceful sound; calls up the words "to arms!"

VII. Ti-rel. (Vowels both short.)

Bell-like; musical and melodious; implies recreation; visualizes a country dance in the moonlight; slightly erotic. Energetic and speedy; runs together well; suggests the full pleasure of animal spirits. Just a happy little fool's song; jolly. Good lyric poetry; "It may be flip, but never mind"; the sounds run together beautifully. Exciting and exhilarating; feels the pitch to be very high; brings a joyful and exuberant feeling.

VIII. Un-dol(e). (First vowel short; second, long.)

Has distinct musical quality, but the tone is sad and mournful. Romantic, but doleful; recalls the "Niebelungen Lied"; implies the pathetic fallacy. Quiet and sombre; calls up the tolling of a bell; exceedingly passive thing. Means a mild lament, or self-pity; the nasal sensations almost become unpleasant.

IX. A-ren(e). (Short "a," long "e.")

Almost meaningless and nonsensical; seems to be calling someone by name. Not poetic; thought of things colloquial. More energetic than "un-dol." Very uninteresting and commonplace; "ri-tin" was intellectual; this is stupid. Has a romantic quality; seems like some amorous declaration; musical. A small sound; it is minor music; makes one quiet and thoughtful; might arouse pity and sympathy.

X. Ri-nad(e). ("I" short, "a" long.)

Something mournful about it; but not much to it. Induces a slow, passive state. Seems to stay way back in the mouth cavity; can't raise the pitch enough to make it effective. Seems contracted and nasal; has no life or activity to it; too inward. Emphatic; almost a battle cry; very dignified sort of a thing.

XI. Un-rin. (Both vowels short.)

Emphatic; the rhythm is easy and regular, but the nasal quality is not enjoyable. Something hopeless about it; seems like a cry; Shelley's poetry came to mind.

XII. Ti-ra. (First vowel short; second, long.)

Thinks of something like political excitement; "sis-boom-bah-rah" and Roosevelt prominently in mind. "It's just some conversation." Nice and quick; happy and joyous; expansive; suggested "hooray." Implies jubilant and exultant action.

XIII. Ni-dal. (Both vowels short.)

Reminds of very fine and pleasing music. Active and energetic; suggests the military. Calls to mind the girls of Biskra in the street of Ouled Nail. "It tumbles out of the mouth before you want it to"; implies following the line of least resistance. Something important and also impatient about it; implies hurrying.

XIV. Ri-leet. (Short "i.")

Like a bird song; bright and vivacious. Not very deep, but joyous; images a woodland scene in the summer; birds and squirrels plentiful. Feels hurried; thinks of the song of a lark. Thought of "relief," "rillet," etc. Very dainty, light and springy; something bright and feminine about it.

XV. Ti-reen. ("I" short.)

Thinks of the mightiness of nature; wild gray ocean and sea gulls imaged. The explosive quality of "ti" well counterbalanced by "reen"; it's like a ditty sung to oneself. This is romantic and "eulogistic"; might be a love sonnet, or some manifestation of devotion.

XVI. Ri-nel. (Both vowels short.)

Has a bell-like quality; "rin" is subjective; "el" objective. Like a bell; tranquil, but not solemn. Seems to swell in volume as it proceeds; good sound with which to call any one. Something personal, fatalistic, and strong about it.

XVII. Ni-lur. (Short "i"; "u" as in "fur.")

Seems deceitful, and slippery; too smooth to have any body to it. Implies a Byronic despair; visual imagery of a gray cold autumn sky. Difficult to say; gets way up in his nose; suggests peevishness; wanted to prolong the "lur" so as to get a firmer hold on the "ni." Hard to say; lacks body; felt almost tongue-tied. Calls to mind some foolish person, perpetually grinning; mouth sensations disagreeable. Very emotional; an intoxicating riot of sounds; full of color.

XVIII. Ri-dev. (Both vowels short.)

Very peculiar; thought of a hot, summer day; also some fiery, physically exciting passion obtruded. Unusual sound; "devil" the only thing that came to mind. Dramatic; alluring; wanted to make it impressive; something funereal about it. Has resonance, but gives a drawn-in, contracted feeling. Funereal and mournful thing; yet has musical quality and fascinates one.

XIX. Ni-rees. (Short "i.")

Very musical; sounds like whistling. Feels the "s" stops one short; like putting on the brakes suddenly while driving an auto. Mouth movement seems delicate; tends to fuse into "nireesnires," etc., without stopping between the syllables; like singing a little tune to himself; feels contemplative. Sort of a "love motif"; imagery of a woodland scene, with birds and soft, quiet places. "S" softens, hushes, smoothes; very light and dainty sounds; "s" also seems like spreading something over a broad surface. Foreign sound; slightly wistful; yet gives a feeling that something is inevitable. Quieting, slightly monotonous sound; thought it descriptive of the waves on the sea shore.

XX. Un-reen. (Short "u.")

Something profound about it; a sad, unsatisfied cry, either sexual or spiritual. Sounds like a call for help; or else it is some exposition of an important theme. Doesn't allow one to expand; a climax foreshadowed, but not reached. Something romantic, supplicating and pathetic about it.

XXI. Ni-ral. (First vowel long, last vowel short.)

Imaged a big country fair, where everybody was having the time of his life; "ni-ral" is everybody calling everybody else. Called up visual image of Millet's "The Lark." Makes him keep his mouth open all the time; gives a cold feeling all over; the "i" seems like something pointed; almost deprecative.

XXII. Thi-ra. ("Th" sonant; "i" short; "a" long.)

Has much quality, but the lisping character of the "th" almost killed the feeling tone. The syllables do not seem to belong together; "th" irritates; seems like a lover's lisp. Peculiar mixture of sounds: "th" always repulsive; "ra" very fine; almost a case of mixed feelings. Difficult to say; seems like a scraping movement along the ground. "A horrid, tongue-tied lisp."

XXIII. Ne-mal. ("E" long; "a" short.)

Implies a superficial pessimism or complaint. Tends to become "nemel" and "nemalne" (trochaic); seems to be just a matter of daily conversation, buying and selling, and the like. Insistent and affirmative; "ne" is the disturbing factor. Implies maliciousness, anger or irritation; it climaxes into a veritable fury.

XXIV. Ri-naz(e). ("I" short; "a" long.)

Very subjective thing; "az" makes it so inward. Slightly energetic; imagery of a rainy day in the country. Slow, monotonous, sombre, deadening; demands much attention to keep saying it. Smooth, but lacks body; like the voice of a mediocre clergyman giving a nice, homely sermon. Quiet- ing, harmonious quality to it; implies the pleasant acceptance of a situation, suited to one's abilities. It means homage to some Oriental monarch whose name is "Rinaz." A lullaby; something almost hypnotic about it; fascinating.

XXV. Ro-len. ("O" long; "e" short.)

Expresses activity, but a superficial kind. Active, and quick; rolls right along. Clear cut, vigorous and manly sound; personal reference to it. "Rol" should have the accent; hence it shuts off the effect of the intended iambic. Rather matter of fact and unimaginative. Rather strong and vigorous; tendency to anticipate the accent with the finger. Pleasant alternations of the vowels; "en" brings one right up standing.

XXVI. Thi-nal. (Both vowels short.) (Th surd.)

"Th" is the disagreeable part of it; something remorseful about it. Gives a blurred effect; the whole thing seems to lisp. "Th" ruins the otherwise pleasant effect of "nal." Easy to say, but the "nal" is too nasal; it whines; reverberations of the sound felt throughout the face. An unimaginative, practical, downright statement of fact. Harsh, complaining, and unsatisfying; the pitch is too high to be pleasant.

XXVII. Ri-neen. (Short "i," long "e.")

Too nasal to be musical; refers to some one other than himself. Rather tiresome work; thought of rowing fast and hard for no particular purpose. Too nasal; the final "n" is the worst part of it; not so mature a sound as "rolen." "Neen" is cold and hollow; too low in pitch; makes one short of breath and demands great depth of voice; "ri" is by itself quite pleasant.

Even from these fragments of the introspection given in connection with the above experiments, it is plainly seen that the responses of the subjects to the material indicate that they had "gotten into" the business of introspection better than ever before. Much of it, is of course not pure introspection; but the instructions were only: "give me what is in your mind after you have recited this combination twenty-five times." In describing the effect of these sound combinations, then, if to say, "it is like

this or that" may not be introspection, yet it did not seem possible to obtain any other introspective results than the above. And yet, in the light of future experimentation, just this kind of answers upon the effect of the sounds in poetry seems to be the only thing one can obtain, and furthermore, the results obtained from introspecting upon passages of poetry transmogrified into meaningless jargon justifies to a considerable degree the method of introspection which most of the subjects employed. One thing more, also; the idea that the subjects would all introspect upon the physical sensations or learn to do so was quickly expelled from the mind of the experimenter; the threefold instructions,—to give feeling-tone, sensations, and imagery proved to be too autocratic; what we have in the above, typical introspection is mostly feeling-tone and association. However, inasmuch as most of the subjects did not like to think of the movements of the organs of articulation while they were speaking, to have insisted that they do so would have been fatuous.

All in all, the introspection is the valuable part of this set of experiments so far as we have gone with them. Diligent and careful study of the rank lists for the above experiments has failed to show that changes in feeling tone, changes in the feeling with regard to "activity," "passivity," "energy," and the like states can be traced down to the numerical results with any certainty. On the whole, however, the experiments in which the subjects found difficulties of enunciation and the like, produced the longest tappings. Feelings of free activity and pleasurable, "dolce far niente" states usually correlate with lower tapping averages than do other states. The word "activity," however, must not be interpreted to mean a "feeling of work" or "exertion"; often it was hard enough work to recite the combination, but the doing so may have been pleasant or unpleasant, depending upon many factors singly and in a constellation, such as pleasant or unpleasant associations, difficulty or ease of counting the five iambics, and the like; and inasmuch, also, as we have hitherto failed to attempt to "grade" the feelings of pleasure, activity, and the like numerically, correlations of any sort do not show up with

any degree of nicety either way. But the grading of feeling tones is a matter that is on a psychological brink where the footing is horribly slippery; checking up the results would have been necessary, and with this kind of experiments, where the effective phase appears to be so fragile and at the mercy of every other psychological factor, it can hardly be supposed, at least from the results we have already obtained, that to give these experiments all over again in various orders, would have been either wise or fruitful.

We next take up the matter of general correlations between feeling tone and motor discharge, taking all the pleasant, unpleasant, and neutral experiments in groups by themselves and contrasting the means, mean variations and ranges with one another.

Subject	Pl.	Unp.	Neut.	
A. M.	95.9	92.7	91.7	P U N
M.V.	3.0	3.6	3.1	U N P
Rnj.	15	19	17	U N P
B. M.	88.0	86.1	88.6	N P U
M.V.	3.1	3.6	4.6	N P U
Rnj.	18	17	21	N P U
C. (as above).....	107.3	107.4	104.8	U P N
	2.5	2.6	2.7	N U P
	10	11	12	N U P
F.	89.2	89.7	100.1	N U P
	3.2	3.1	3.4	N P U
	17	18	16	U P N
L.	73.8	72.4	74.0	N P U
	3.6	3.7	4.1	N U P
	16	18	20	N U P
N.	86.7	84.8	83.3	P U N
	2.9	2.5	2.7	P N U
	15	11	14	P N U
T.	76.7	—	73.2	P N
	3.4	—	3.6	N P
	18	—	19	N P
W.	95.1	95.2	95.6	N U P
	2.4	2.2	2.5	N P U
	12	10	13	N P U
Y.	50.7	52.3	47.1	U P N
	3.1	4.1	3.2	U N P
	14	18	17	U N P

The difference between these various averages is very slight, and in every case the variations from it are great. But they are usually greater for those which have been obtained while the subjects were in a pleasant state of consciousness than otherwise. Neutrality and unpleasantness appear to work up to a better level in the motor consciousness than does pleasurable; furthermore, introspectively, there are more varied states of pleasure than of unpleasantness; if what the subjects gave introspectively is of any importance, this appears to be empirically substantiated,—they got after a while to be very reticent about the introspecting upon the unpleasant combinations, saying only such things as "very bad," "I do not care for that at all," and the like. But when they got a pleasant combination, they would even wander into forbidden fields of introspection and bring back material which had apparently no connection with the subject in hand. Not all of them, however, but it is quite the fact that the subjects who found most of these combinations pleasant, show up the most negatively in these correlations; at least those who got into the most effervescent states of mind offer those numerical results which are the most recalcitrant to satisfactory correlation.

HINTS OF A TONAL CALCULUS

We now turn to the graphs for these experiments. Tiren and Tireen were taken together; and Unrin and Unreen also; these were drawn in pairs to show the differences obtained from those experiments which were the nearest alike. We treated in the same way the graphs for Tira and Thira, and also for Rinaz and Rinad. The remaining nineteen graphs were arranged in groups for similar purposes of comparison.

Comparing Tiren and Tireen, it appeared that the short "e" in Tiren was responsible for the elevation of this graph above the other. Apparently, also, the "long" E did not "live up to its privilege," for the graphs were of exactly the same length, even group by group. But the Tiren exceeded the other graph in height only at the beginning and end of its course. Also, the effect of the Tireen was steadier than that of Tiren. The latter showed an average rise toward the fourth iambic and then a

sudden descent. This also holds true in all the groups but the last, as appeared from the long Tiren graph.

A comparison of the next two, Unrin and Unreen, showed less difference in the general motor discharge aroused by these two graphs than was evident in the case of the former two. This might be due to a number of things; first, the difference in the structure of the unaccented syllables in these pairs: -un may determine the motor supply as much as the -rin or the -reen. But the differences in the accented vowels are also to be taken into account, for in the one pair, short "e" and long "e" alternated, while in the other, short "i" alternates with long "e." Hence we have two variables, and not one to deal with.

Rinaz and Thira produced the strongest effects of the Rinaz-Rinad-Thira group and they were nearly equal in height and very similar in form; Rinad and Tira were exactly identical in form, but not so close together as were the other two. Evidently "th" and "z" gave the impetus to the responses, and the open "a" was in each case provocative of restraint in the tapping, for the open "a" experiments took longer time to utter than those which closed with "z" or "d." Rinad was found by the subjects to be a rather poor stimulus, while they attributed to Rinaz a sort of hypnotic or lulling character; yet the graphs show that the latter of these sound-combinations was more arousing than the other. But as a general thing indifferent states were correlated. Meanwhile with a greater motor output than were the pleasant. But Rinaz was the more pleasant of these two.

Comparing Niral and Nidal with one another it appeared that the "r" as an initial accented consonant has a greater motor effect than does initial "d." And yet the "d" can be given a much more explosive vocal character than the "r." But the long "i" in Niral must not be forgotten. Nermal showed very well, especially in the fourth group, the insistent character which was attributed to it in the introspection. Comparing the lengths of these graphs does not seem to throw any light on the matter of correlation, for while the long "i" in Niral might be construed as that factor which gives the length to this graph, yet Nerol is

equally long, but Nerol was the first of this series to be given, and perhaps the subjects took longer to say it because it was something new in the way of utterance.

The next group of graphs showed among other things, the various effects of final "l." It is not surprising that Idrel took a longer time to repeat twenty-five times than did Tirel; even the manipulation of the organs of articulation is a more difficult matter for the former combination; time is about the only noticeable difference between the two graphs, their height being about equal. Undol and Unral were also close quantitative equals, but the slightly greater effect of Unral at the beginning of each group, as was seen from a combination graph, allies this effect of "r" with those noted above. It would seem then, that sometimes articulation force (*e.g.* the explosive character of some consonants) is represented in the tapping in an inverse proportional.

Tirel proceeded more evenly across the page than did any other of this group of graphs, but in the final summation graph, Rinel showed that the average stress on each of the twenty-five iambs was exactly the same. Unfortunately such summation graphs were not duplicated to any but the slightest degree in the longer ones and so their significance is doubtful; one point is to be made, however, and that is that where lack of uniformity between the separate groups of the larger graphs is manifest, all that can be stated about the summation graphs as regards one another is just as significant as that which can be stated about the longer graphs.

In regard to the general effect of final "l" in these combinations, one thing is quite remarkable; and that is the frequency with which the fifth iambic of a group ends with a *descent* in the curve. It is exactly fifty per cent: about ten per cent of the time, also, there is no change from the fourth to the fifth foot. The conclusion seems to be that the tendency of final "l" is to produce its greatest motor effect in some other foot than the fifth, when repeated in the manner employed in the above experiments.

The next five graphs cannot be so strictly compared with one another, but if we consider those having long vowels, it appeared that they extended slightly farther to the right than did the others. The longest, "Ritin," seems to offer some sort of positive correlation in regard to the long "i" in the accented syllable, but by comparing it with those which we have hitherto considered, we find that *"length" of vowel is an equivocal expression in reference to the motor consciousness.*

It is proper now to see whether we can deduce anything from the above twenty-seven experiments by combining them in various groups, for many of them contain exactly the same factors in either the accented or the unaccented syllable.

First: arranging these experiments in the order of greatest to least amount of motor discharge called forth in the tapping we get column I. The figures represent 425 tapped strokes (9 subjects, each one tapping 25 times.) Opposite these numbers are the feeling tone judgments of P, U, and N, with the number of times each judgment was made, regardless of which subjects contributed to that particular mass of judgments.

		P	U	N
Idrel	88.4	5	3	1
Tirel	87.4	8	1	0
Tulin	87.0	6	1	2
Nemal	86.8	3	3	3
Rolen	86.8	6	2	1
Ritin	85.8	3	2	4
Thinal	85.4	1	7	1
Niral	85.4	4	4	1
Thira	84.8	4	3	2
Rinaz	84.8	8	1	0
Aren	84.6	5	1	3
Undol	84.4	7	1	1
Unral	84.4	3	3	3
Rineen	84.0	4	5	0
Unrin	83.6	2	3	4
Nerol	83.6	7	0	2
Tiren	83.6	5	3	1
Unreen	83.4	4	4	1
Ridev	83.2	2	5	2
Rinel	83.0	5	2	2
Rinad	82.8	3	3	3
Nirees	82.8	7	2	0
Nidal	82.4	5	2	2
Tireen	82.0	6	2	1
Tira	81.8	5	1	3
Nilur	81.6	2	5	2
Rileet	80.8	8	1	0

If, now, one arranges these same experiments in two columns, one indicating a decline in the amount of motor discharge, and the other a descent in pleasurability, it can be seen how far, generally speaking, these two factors are correlative. Likewise, taking the motor decline once more and pairing it with another list indicating the decrease in unpleasantness for the same experiments, another set of correlations can be obtained. We have determined the pleasurability and unpleasantness on the following basis: where under the P column or the U column we find the same numbers, *e.g.* P U N and P U N, we have

5 2 2 5 3 1

called the first of these the more pleasant, and the second the more unpleasant; where we find the following situation P U N P U N, we have called the second of them the more

6 1 2 7 1 1

unpleasant. Here, as in the former experiments upon the simple vowels and consonants, we find that pleasantness and amount of motor discharge are inversely correlated. The average divergence of the position of terms in each column is about ten points away from a one to one correspondence. We now come to another interesting phenomenon. Taking those experiments which are nearest alike, and computing from their difference the effect of one vowel over another, or one consonant over another in the motor consciousness, we can draw the following tentative conclusions. To begin with pairs of experiments:

Exp.	M.D.	P	U	N	Here the unaccented "Th"
Thira	84.8	4	3	2	has a greater motor effect than
Tira	81.8	5	1	3	does "T." Also the feeling tone

correlation is strong for the increased motor effect of the unpleasant. Take another:

Exp.	M.D.	P	U	N	Here short "i" accented has
Unrin	83.6	2	3	4	a greater motor effect than does
Unreen	83.4	4	4	1	long "i"; and the same feeling

tone correlation also holds true as with the above.

Again, Exp.	M.D.	P	U	N	In this pair the short
Tiren	83.6	5	3	1	vowel may be credited
Tireen	82.0	6	2	1	with the greater motor

effect.

And in Exp. M.D. P U N We find the accented
 Rinaz 84.8 8 1 0 find "z" as that ele-
 Rinad 82.8 3 3 3 ment which gives the
 greater motor effect. But in both of the above, feeling tone
 inferences are dubious. Let us now compare several groups:

Exp.	M.D.	P	U	N	
Ri-tin	85.8	3	2	4	Here the long accented vowels seem to have the advantage, and the "naz" and "nad" do not contradict the deductions about them made immediately before.
Ri-naz	84.8	8	1	0	
Ri-neen	84.0	4	5	0	
Ri-dev	83.2	2	5	2	
Ri-nel	83.0	5	2	2	
Ri-nad	82.8	3	3	3	
Ri-leet	80.8	8	1	0	

Exp.	M.D.	P	U	N	
Ti-rel	87.4	8	1	0	Here the short vowels again produce, or assist in producing, the greater motor effect. Deductions on the basis of feeling tone are hardly possible in either of these two groups. We make two more comparisons:
Ti-ren	83.6	5	3	1	
Ti-reen	82.0	4	4	1	
Ti-ra	81.8	5	1	3	

Exp.	M.D.	P	U	N	
Ni-rees	82.8	7	2	0	Here the feeling tone enters again as an apparent factor, but rather contradictorily to what has been deduced from the experiments as a whole.
Ni-dal	82.4	5	2	2	
Ni-lur	81.6	2	5	2	

Exp.	M.D.	P	U	N	
Un-ral	84.4	3	3	3	Which completes our groups of this kind.
Un-dol	84.4	7	1	1	
Un-rin	83.6	2	3	4	
Un-reen	83.4	4	4	1	

In connection with the next matter, a few symbols are necessary. Let K_1 = the accented consonant which stands immediately before the accented vowel, thus: ni-Ral, un-Dol, etc. Let also K_2 = that accented consonant standing immediately after the accented vowel, or which closes the accented syllable,

thus: *ni-raL*, *ri-niZ*, etc. Let also *V* stand for the accented vowel, and let the letters *i*, *e*, *a*, etc., represent the short vowels, and the letters *I*, *E*, *A*, etc., represent the long vowels. Let also the symbol $>$ stand for the "greater than" and the symbol $<$ stand for "less than." Then, in general, taking all the commonly used accented final and initial consonants of the accented syllables, we have:

$$K_2L > K_2N = 17.4 > 15.5$$

$$Ve > VE = 17.3 > 12.0$$

$$Va > VA = 17.5 > 12.8$$

$$\text{and } K_1L > K_1R > K_1N = 17.0 > 14.0 > 13.6,$$

so that the motor effect of $K_1N <$ the motor effect of K_1R and also $<$ that of K_1L . We can say, then, that of the consonants, K_1L and K_2L have the greatest motor effect, and the short vowels also, in general, rank with them. This is significant, and shall be used later in the correlation of large masses of sounds.

3. TRANSMOGRIFICATIONS OF ENGLISH POETRY

This part of the work includes several kinds of experiments. According to the plan outlined in the early paragraphs, we are now to consider the effect of more complicated collocations of the speech elements than have been hitherto employed. The poets themselves are experimented upon from now on, and in a two-fold manner: first, by casting into decasyllabic lines the sounds as they appear in the tabulations of frequency, and then by employing both single lines and ten-line passages from poetry to show the various effects of combination with and without meaning.

THE EFFECT OF MEANINGLESS SINGLE LINES FROM THE TABLES OF SOUND FREQUENCY

We now turn to the first of these experiments. They were devised to show the psycho-motor effect of those sounds which certain poets use most frequently as well as those which they use less frequently, and in each case they attempted to illustrate the proportion of use by the frequency of repetition in the

decasyllabic line into which they were arranged. Taking four of the poets from the tables of sound frequency hitherto mentioned, we find them using the sounds of the language in the following proportions. We take only the first twenty or more sounds from each one, accented and unaccented alike. (Short vowels, small letters; long ones, large.)

Acc.	Keats		Byron		Tennyson		Arnold	
	Unacc.	Acc.	Unacc.	Acc.	Unacc.	Acc.	Unacc.	
R	3.9 u	5.3:R	5.3 u	5.3:R	5.0 u	5.3:R	5.5 u	4.0
N	3.7 i	4.1:N	4.0 N	4.5:L	4.5 i	4.0:N	4.6 i	3.4
L	3.5 N	3.5:L	3.5 i	3.4:T	3.1 N	3.2:L	3.6 N	3.0
S	3.4 R	3.1:E	2.9 R	2.7:M	2.7:Th	2.9:T	3.3 a	2.9
T	3.1 T	2.3:D	2.5 T	3.1:S	2.6 R	2.8:S	3.1 D	2.6
D	2.5 S	2.0:M	2.4 Th	2.3:E	2.5 D	2.1:E	2.3 Th	2.5
e	2.1 Th	1.9:S	2.4 e	1.7:a	2.3 a	1.8:A	2.2 L	2.1
V	2.0 e	1.7:T	2.2 Z	1.7:I	2.1 L	1.8:D	2.2 Z	1.8
u	1.9 O	1.7:O	2.1 O	1.6:D	2.0 Z	1.8:O	2.1 R	1.7
E	1.8 L	1.6:A	1.8 D	1.6:N	2.0 T	1.8:F	2.1 E	1.7
P	1.7 a	1.5:u	1.8 a	1.5:Z	1.9 Th*	1.6:I	2.0 T	1.6
M	1.9 D	1.5:I	1.6 I	1.4:P	1.9 Ng	1.0:M	1.8 e	1.4
A	1.7 K	1.4:e	1.5 E	1.4:i	1.8 W	1.0:o	1.5 H	1.4
F	1.7 Ng	1.1:a	1.4 Th*	1.3:B	1.7 E	.9:e	1.4 Th*	1.3
i	1.6 Th*	1.1:i	1.4 o	1.2:o	1.6 I	.9:K	1.4 W	1.3
K	1.6 M	1.0:P	1.4 L	1.2:F	1.4 e	.8:W	1.3 S	1.1
H	1.4 W	1.0:K	1.2 S	1.0:W	1.4 e	.7:Z	1.3 B	1.0
I	1.3 E	.9:o	1.1 M	.9:u	1.3 O	.7:i	1.2 A	.9
O	1.3 F	.8:F	1.1 W	.8:K	1.3 H	.7:u	1.2 K	.7
W	1.2 V	.8:V	1.3 B	.8:e	1.2 OO	.6:a	1.0 Ng	.7
Z	1.2 Z	.7:Th	1.1 P	.8:O	1.2 K	.6:B	1.0	
				:G	1.2 St	.6:P	1.0	
						:St	1.0	

* Surd.

All but one of these poets, Byron, employs his sounds approximately in the ratio of ten accented to eight unaccented ones. Byron uses nine unaccented ones to every ten accented ones. We took the first seven accented consonants and the first three accented vowels, and the first five unaccented consonants and the first three unaccented vowels from the other three poets; in Byron's case the same number of accented sounds were used, but six unaccented consonants and three unaccented vowels were taken to make his 10:9 proportion. Taking then, ten accented sounds from each of these poets, and the proportionate number of unaccented sounds, and arranging them in a line of five iambs with the

most used sounds in the more prominent places in the line, namely the first and the last feet, we obtain the following four experiments:

Keats: Nĩ rŭl sŭ vēēd rĩ nēst ĭt ěl ĭth rēēn.

Byron: Zŭ rēēn tĩth nōle dēř tŭll thĩn sōde tŭ rēēm.

Tennyson: Thŭ rāl dĩ rēēt thŭ nĩme rā dēēs ũn tāl.

Arnold: Thŭ rēēn đĩn lāse ză fōde nĩl tāne thŭ lēēr.

The 10:8 and the 10:9 proportions are fairly well kept in these combinations, as can be proven by counting the sounds. The arrangement of sounds is quite arbitrary, but in making such a combination, there are many things to be considered besides mere proportion. For example, one must test by means of his ear what combinations are suitable to follow one another; and when strict proportion cannot be followed, one must be judicious.

If, now, we take the next ten accented sounds in the lists, and combine with them the proper number of the next eight or nine unaccented sounds, we have the following experiments for these poets:

Keats: Lă māz mō kĩf dē pōth lă pām wē hō.

Byron: Dō thăv lō pĩ sē kě đă thĩp lĩ vā.

Tennyson: Tē pōz lĩ bĩn ěng wō zĩte nŭf wē nōp.

Arnold: Rē mōz ět wĩk sā thŭ wē zēm hē mĩ.

(It must be noticed that when the appearance of the list indicates that more than three vowels to seven consonants are the materials out of which the experiment would normally be made, we have followed the list, rather than discarded the prominent elements in it.)

These experiments were presented in pairs: first the two representing Keats, and after that the others in the order in which they occur above, finishing each poet as we proceeded. Each line was tapped and recited five times. The instructions were to read the line over until it became easy to read; but not to wait until associations came up; then the tapping and reciting went on as it had done before, the instructions again being to

"tap at each accented syllable." A few of the subjects practised reading the lines over once silently and tapping at the same time, in order that full preparation for the experiment would not be lacking. The idea was to get the full effect of the line *while tapping*, in order that the motor manifestations could be called representative in the fullest sense of the word. The introspection which they gave for these experiments follows:

Keats I. (The first ten accented and the first eight unaccented sounds.)

Visual imagery of maples and other deciduous trees in the fall of the year; the air is frosty and the whole scene is grayish; very objective.

The rhythm feels like dance music; very contagious; thought of evening bells; very romantic. Gentle thing; not much action to it; a little Spencerian; deals with pastoral things.

Keats II. (The second group of Keats' most used sounds.)

Visual and auditory imagery of the surf; also of fields; sounds go well together. Seems short and broken up; compares it to an "Italian" salad. Brings imagery of the sea; thinks of something like the "Ancient Mariner." Not very active.

Byron I.

Something superficial about it; kinaesthetic and visual imagery of idly following things about. Minor, meditative and solemn; attributes this to the long vowels; thinks of something like "Crossing the Bar." An epic, recounting adventures. Deep and funereal.

Byron II.

Active thing; relates to strength and power and brawny arms. Sounded like the speech of a big-chested, half-civilized people living in a cold climate. Rather dramatic and superficial.

Tennyson I.

Inactive; sad throughout; subjective thing. Evokes pity and compassion; elegiac thing; sorrow, not wild, but quiet and domestic implied. Very rhythmic; gives a feeling of solemnity felt in the midst of happy surroundings. Images of a quiet, restful woodland scene. Asked if it was Tennyson. Just a little dramatic; not quite sincere. A little tragic and sorrowful; thinks of Fate.

Tennyson II.

Rhythmical and dramatic; sounds Shakesperean. Kinaesthetic imagery of many motions in different directions. Makes him short of breath; thinks of dying gladiators; mentioned "Heldenleben." An explanation in some dialect of an unfortunate event.

Arnold I.

Something strong and military about it. Rhythmic, but not very deep. Medieval and romantic; seems to be a description. Thinks of the "Meister-singers"; active and objective.

Arnold II.

Unpleasant taste images aroused; something psycho-pathic about it. Inter-esting, but not emotional; full of irritating things; more like conversation than anything else. Leaves one a little gasping; sounds like some one timidly trying to recite.

It must be remembered that these combinations were pre-sented to the subjects without their knowing what poets they represented; nor was it a guessing contest, either; no stress was laid upon anything but a good reading of the lines.

There follows the correlation between feeling tone and motor discharge, in general, for all the subjects in the above experiments.

Subject				
A. M.....	94.3	91.0	104.9	N P U
M.V.	2.1	2.0	3.4	N P U
Rnj.	10	12	16	N U P
B. (as above).....	74.0	—	72.2	P N
	3.4	—	3.6	N P
	15	—	17	N P
C. " "	92.5	—	82.0	P N
	3.6	—	5.5	N P
	19	—	27	N P
F. " "	73.5	75.7	—	U P
	3.6	3.8	—	U P
	17	18	—	U P
L. " "	72.0	74.8	—	U P
	3.2	2.7	—	P U
	18	15	—	P U
N. " "	85.2	84.6	—	P U
	2.4	2.0	—	P U
	12	11	—	P U
T. " "	75.3	77.4	—	U P
	3.0	3.7	—	U P
	20	13	—	P U
W. " "	87.8	85.9	91.2	N P U
	2.3	2.5	2.4	U N P
	10	13	12	U N P
Y. " "	39.9	41.9	52.0	N U P
	2.3	3.2	3.0	U N P
	15	17	19	N U P

Comparing these results with all similar correlations, we find that none of the subjects have remained constant during the experiments, as is evidenced by the following. A.'s longest tappings were twice for the pleasant, twice for the unpleasant and twice for the neutral. B.'s were three times for the pleasant, twice for the unpleasant, and once for the neutral, etc. The whole list is given below.

A.	P 2	U 2	N 2	
B.	P 3	U 1	N 2	
C.	P 1	U 2	N 2	(this subject did not begin with the others)
F.	P 3	U 1	N 2	
L.	P 0	U 3	N 3	
N.	P 3	U 1	N 1	(only one kind of judgment was made in one series)
T.	P 4	U 2	N 0	
W.	P 2	U 1	N 2	(only one kind of judgment was made in one series)
Y.	P 1	U 1	N 1	(this subject did not begin with the others, and in one series made only one kind of judgments)
	19	14	15	

Comparing the M.V. and the Rnj. in a similar manner gives equally varied results.

Let us now consider the graphs for these experiments. Their resemblances were more striking than their differences, and it is not unlikely that the reverberations set up in the motor consciousness just by this new material were too strong to be altered by the other factors involved. In the first place it was found that these experiments produced a much lower motor output than did those preceding them; Idrel had reached a height of 88.4 mm.; none of these reach anything above 78.8 mm. (the Arnold II). Massing together the P, U, and N judgments, and correlating them with the amounts of motor discharge as shown by these graphs, we obtain:

		P	U	N
Arnold II.	M.D. av. 78.8 mm.	3	4	2
Tennyson I.	78.6	7	1	1
Byron II.	78.4	8	0	1
Tennyson II.	78.0	4	4	1
Arnold I.	77.6	4	4	1
Byron I.	77.4	5	4	0
Keats II.	77.2	7	1	1
Keats I.	76.6	7	1	1

This comparison would seem to indicate that the most pleasant experiments go with the strongest *and* the weakest tappings,

while the most unpleasant tend to produce those which are midway between the greatest and the least. No correlation with the feelings of activity adds anything to what we have already observed, that sometimes, and sometimes only, the feeling of ease means longer finger strokes, and feelings of inhibition and difficulty mean shorter strokes.

None of the experiments numbered III are given for any of the poets, and hereafter only No. I of the first three is presented, because it represents better than do the others the differences in sound frequency for the poet. No. III, however, was constructed by combining half of the first and half of the second of the above groups of sounds, Nos. I and II, to illustrate the poet's use of those elements which are not either very frequent nor infrequent, and thus we had a set of three experiments which began with the liquids, and ended with the gutturals and fricatives.

Experiments numbered IV, V, and VI in the case of each poet are transmogrifications of single lines of poetry; experiments VII, VIII, and IX are lines of poetry rearranged, keeping the accented words of the original accented, and the unaccented words unaccented. Experiments X, XI, and XII are lines of poetry, "clothed and in their right mind," and for each of the twenty poets experimented upon there are these twelve experiments, which start with the tonal elements, pass through the nonsense verse of transmogrification, through also the ungrammatical poetry into the normal meaningful lines from which all had been ultimately derived that preceded them. Thus we had 240 experiments upon the poets arranged in such a way as to supply sufficient data for a compact thesis in itself. In the case of nine of the twenty poets, the same material entered into the transmogrifications, rearrangements and the meaningful lines, so that Experiments IV, V, and VI were the transmogrifications of the material in Experiments X, XI and XII respectively, and Experiments VII, VIII and IX were the rearrangements of the same material as had been used in the others. In the other eleven poets, which were experimented upon first,

only now and then was such a symmetrical arrangement carried out. We decided upon the method of repeating the same sounds in three different relations in order to exactly determine what both grammar and meaning had to do with the effects of the poetic line upon the motor and the introspective consciousness. But only in the case of four of the poets do we give the experiments from IV to XII. What has been omitted will be considered in later, summarizing paragraphs.

It was the purpose at first to obtain experimental material from the poets which would duplicate in tonal quality Experiments I, II, and III; after a futile search for such lines, it was given up; too many extraneous elements entered into the matter. In the first place, very few lines of the poet actually follow the tonal pattern of the first experiment in our series, and those that do, usually contain inverted iambics, if they contain iambics at all; in the second place, to find decasyllabic lines that are regularly accented in the iambic pattern is not always possible, and when such are found, they are likely to be some of the poorest lines, esthetically considered, that the poet suffered to leave his pen. So that in every case almost, Experiments I, II, and III are in a class by themselves, and the other nine experiments of the series are in another class.

THE TRANSMOGRIFICATION OF SINGLE LINES OF POETRY

The business of transmogrifying single lines of poetry is quite difficult, for the restrictions placed upon one in this work are very rigid,—words must not be made, and sounds must not be left out; again, to avoid making words, one may have to construct a very badly sounding line, and sacrifice to the purpose of the experiment much of his artistic predilection for the beauty of tones; let any one who doubts the difficulty of the matter attempt the task, and he will find that we have but lightly touched on the obstacles to be encountered. The transmogrifications we have used in this experiment are but a fifth of the number which we attempted to complete with satisfaction to ourselves.

These experiments were presented in the order in which they are given in the following pages. The first four poets experi-

mented upon were Byron, Keats, Arnold and Tennyson, and the forty-eight experiments upon them were well under way before the I and E Experiments had been completed. This was a relief to the subjects, who rather chafed at the idea of having so many similar combinations week after week.

There were fifteen experiments performed on Keats, but we have omitted all but twelve in our consideration, because we discovered that the others were of no importance for the work in hand. Our original plan had been to experiment upon very many more than twelve decasyllabic lines for each poet, but time did not allow, and this had to be given up. Neither were the subjects able to react to twenty experiments an hour as well as to twelve.

The introspection for the Keats and Byron experiments is very interesting indeed, from the very start, and the transmogrification of the famous line from Byron's "Apostrophe to the Ocean" was a decided success, but it is not beyond cavil that the line may have contained too many hints at the sense of the original verse.

After the introspective account of the matter, we have given the numerical results which we shall consider at once.

Keats IV. Wõn fěmz ē nānj öv dī nāl těr ěn tēēv.,* transmogrified from "One faint, eternal eventide of gems."

Nothing in the introspection compared to the original meaning or mood of the line.

Keats V. Tōō zowb ĩth bīnd thǎ rāwl mē tīng wīn tī. From "To bind them all about with tiny rings." Introspection.

Visual imagery of a farm; auditory imagery of some bells ringing. Sounds like an ode; vocal placement seemed forward in the mouth. Gives a light and cool effect; the sounds vary in pitch very much; more resonant than the former one.

* From now on the diacritical marks will have their usual significance over single vowels; but when two vowels occur together, the following interpretation is required: ēē = ē; öö = the oo in "brook"; ōō = the oo in "food", etc; a as in "ask" is indicated by no mark at all; in addition to this, the ow, aw, ou, oi, and other diphthongal sounds are pronounced as usual in English. Differences between the sonant and surd th, are not indicated here, though they were in the experiment.

Keats VI. A thûrn ūs tōō thū bow tōō flāndry bīde. From "A flow'ry band to bind us to the earth."

Very rhythmic line; Chaucer's poetry came to mind. Imagery of a high tower; romantic scene, maybe some battle being narrated; romantic and idyllic. "Flaundry" a strange word; thinks of "Flanders" and "laundry" at the same time.

Keats. Experiment VII. So cooling very still was and the air. From "The air was cooling and so very still."

Imagery of the twilight. Visual imagery of a bright green color. Cool sensation in the mouth. Very conscious of lips.

Keats VIII. The dwindled of its trace and edgings brim. From "The trace and dwindled edgings of its brim."

Imagery of snow; "trace" a "cold" word. Feels lips to be very active.

Keats IX. Across the move would blue a little cloud. From "A little cloud would move across the blue."

Gives an inane feeling; "move" and "blue" are "sticky" words; "cloud" doesn't go with them. Cannot say "little cloud" fast enough to suit the line. The word "across" is too hard; the "k" sound sticks. Lips rather prominent in consciousness.

Keats X. A bower quiet for us and a sleep.

Odd that the guttural should have been used,—"quiet." "Bower" the only "quiet" sound. Uses too much breath for the meaning.

Keats XI. "With lucent syrops tinct with cinnamon."

Thinks of toddy and cordials; just the opposite kind of a scene came up. Much taste imagery; visual imagery in bright colors. The line hisses too much; imagery of peppermint. Tickles the tongue.

Keats XII. "That broodest o'er the troubled sea of mind."

Mind in a quiet uncertainty. Thought of Byron, and Hamlet; visualized a cliff. Feeling of a cosmic melancholy. Gives a gentle melancholy; "mind" too abrupt.

Byron IV. Shūn dōle ow rōd thū nārķ blōre ō lānd ēēp. From "Roll on thou dark and deep blue ocean, roll."

Visual imagery of some one on a rock by the sea; sounded like a foreign language. Subject A.—Imagery of the ocean, in a storm; the jerky effect here is justifiable. B.—Imagery of a ship on the ocean in stormy weather; seemed to take more force. D.—Imagery of the sea; heavy waves; dark colors. F.—Sea imagery; "nark" is very hard. "Blōre o" is the blowing of a horn. K.—Great deal of resonance; no imagery. L.—Sea concepts aroused; thinks of Norsemen, etc.; very thrilling. M.—Feels the roar of the ocean; visual imagery very rich. P.—Counting bothered a little; imagery of Hol-

land. S.—Mixture of Persian, Arabic and Hindustani language; great deal of imagery of the ocean; sounds fill the mouth.

Byron V. *Thũ vī lānd sã nīl jī tā frō the vĕē.* From "The inviolate island of the sage and free" (with two unaccented syllables omitted).

Narrative poetry; thinks of natural scenes. A gesture could do it all better than words. Imagery of gaudy colors; not smooth sounds. Not very smooth; especially the fourth iambic; imagery of a pastoral scene. Imagery of some big man saying this in a thunderous voice. Lip sensations unpleasant.

Byron VI. *Hās mowd stī rīne whā stĕsh rã mīd thũ krāthe.* From "Amidst this wreck where thou hast made a shrine."

Describing a very interesting place; something troubled and dolorous about it. Implies a rough activity. All the sounds very unpleasant; do not fuse. Too staccato; but "su krath" very good. Just a strange, incomprehensible language.

Byron VII. "With stirred as rose her dream leaves with the air." From "Stirred with her dream as rose leaves with the air."

Ethereal quality about the sounds. Rhythmic; thought of a sleeping girl. The words "air" and "stirred" the best of all; olfactory imagery.

Byron VIII. At bluelit moon and midnight on the deep. From "At midnight on the blue and moonlit deep."

Imagery of a ship at midnight; pleasant self-feelings. Smooth, soft, and gentle combination.

Byron IX. Upon beheld decline who hath my brow. From "Who hath beheld decline upon my brow."

Thinks of a pessimistic old man. Monotonous; takes too much breath. Thinks of some unsuccessful person.

Byron X. "And temple more divinely desolate."

"Emp" sounds pointed. "Desolate" just suits the meaning; it's a cold, blue word; "divinely" doesn't have anything to do with the line. The "hiss" in "desolate" very expressive.

Byron XI. "Yet I was born where men are proud to be."

Prosaic and pessimistic; sounds very resonant. Very strong physical sensations. "Yet" always a vocal surprise.

Byron XII. "And silent rows the songless gondolier."

Very dark and somber feeling induced. "Silent" the only silent word in the line; "gon" in "gondolier" is too guttural. Cheerful and lively line in spite of the intended meaning; "songless gondolier" a tonal equivocation.

The remarkable thing about the graphs representing these twelve experiments upon Byron and Keats was that in nearly every case the motor discharge for the Byron Experiments is greater than that for Keats, and the final averages showed that the combined finger movements for the Byron experiments were eighteen metres longer than they were for Keats. But we must not be too sanguine; the tonal elements in Byron are not the ones which have hitherto been those arousing the strongest reactions, and the fact that Keats was experimented upon first may indicate that we have only practise curves before us in this instance. But there was something rousing and enthusing in all the Byron experiments which the subjects did not find in those on Keats, which may account for the matter more exactly. The character of the lines transmogrified and employed in other ways is very different for the two poets, as any one can see from a glance at the material; but whatever may be the nature of the individual sounds used in the above experiments, we find here that order and arrangement are potent factors, and single decasyllabic lines may produce different effects than do larger passages. One could also notice in these graphs the form quality of the decasyllabic groups,—the regular thing in a rhythmic line is for the first and the last feet to demand more motor discharge than the intermediate iambs. And the form-quality of the Byron lines always differed from those of Keats. Again, the mean variation of the tappings for the meaningful lines is less, according to the graphs, than it is in the first six of the experiments for these poets.

Every one will admit that Byron is a more oratorical poet than Keats, and that there is a power and vigor to Byron's poetry which is not found in any other English poet. It would seem that the temperamental character of the poet had gotten into these experiments, and that also the quieter and more pastoral nature of Keats had not been omitted from the experiments which we graphed with those of Byron. It is admitted that the experiments were made with the different poets in mind, and that even the first three experiments were patterned upon what was

conceived to be the poet's tonal characteristics, but the results are what they are, and whether from one cause or another, they show that the experiments on Byron called for the more activity on the part of the motor consciousness. This is enough.

The next experiments to be considered and compared are those on Arnold and Tennyson.

Arnold IV. Nōr hī būt smōrd hīz nēērd ūkt lōd ōrn wābez.
From "But he looked on, nor smiled, nor bared his sword."

Thinks of a battle; (but "smord" never meant "sword" consciously).
"Smord" and "neerd" indicate the presence of trouble.

Arnold V. Lō mōrdz ūm stūr dīle hūs kēr mīze hīz māfe.
From "Like some old miser Rustum hoards his fame."

Tragic narrative poetry.

"Hus" the highest tone in the line.

"Mafe" not very pleasant; the auditory consciousness much more pleasant than the reading consciousness.

Arnold VI. Zī nōld bē krēm ěs lāj ē rūld shō hīze. From
"Behold, she cries, 'so many rages lulled.'"

"Z" the prominent consonant.

"Kremlin" aroused by "krem."

Seemed to be a "begging symphony" of the Mohammedan beggars.

Arnold VII. As she her echo stormy screams sails by. From
"Echo her stormy scream as she sails by."

"S" the right sound for this meaning.

Imagery of excited movement.

The "s" sounds are very unpleasant; sounds like a poorly oiled wheel.

"Sails" too heavy a word for an unaccented syllable.

Arnold VIII. All who pained desert lion some of day. From
"Of some pain'd desert lion who all day."

Hard to say "pained" in the time allowed.

The words "some" and "desert" disturbed the rhythm.

Arnold IX. Her it the glass lake flying over shall. From
"Shall the lake glass her, flying over it."

Sounds very pleasant; gives a "thin," damp feeling.

Lips much in consciousness.

Mood aroused akin to that of Wordsworth's Lucy poems.

Arnold X. "The sails that gleam a moment and are gone."

"Can this be the same poet as the last nine experiments illustrated?"

Liked the sense but not the sounds or rhythm.

Arnold XI. "Before this strange disease of modern life."

Sounds unpleasant per se; "s" too frequent.

"Strange," very unpleasant and nasal; the "ern" of modern also a bad sound.

Arnold XII. "He lies in death upon the common sand."

"Death" as a sound is very pleasant here; one cannot expand while saying it. The words "common sand" go too quickly for the meaning.

Tennyson IV. *Fōr thārīng kērn hē tōft ā sēēfly thīle.* From "He therefore, turning softly like a thief."

Thinks of the ocean and the surf; "a cynical line."

Means something soft, quiet, and subdued; "kern" is a lovely word.

The letter "k," while dissonant, only brings out the harmony of the other sounds the more.

Tennyson V. *A whīl īn dōst ūr gēnward nīspērs ēēp.* From "Again in deeper inward whispers 'lost'."

Thinks of a soft, subdued scene; evening.

Thinks of whirling dust; whispers; deep; etc.

Thinks of Gray's *Elegy*.

Tennyson VI. *Whār lāmz tōō ūrkīng wīle tōō bīsk ān vōrn.* From "Scorning an alms to work whereby to live."

"Vorn" is Scandanavian; thinks of the early Britons.

"Lamz" = "lambs," but they were not frisky; something dark and wearisome about the line.

"Urk" brings a dead stop.

Sounds like Matthew Arnold; "urk" a little hard.

Very personal, and sad; gloomy melancholy; fatalistic.

Implies a moral situation.

Tennyson VII. *But will made fate in weak by time and strong.* From "Made weak by time and fate but strong in will."

Uninteresting, abstract, philosophical.

The sounds too short for the meaning.

The sense takes away the pleasure of the sounds.

Tennyson VIII. *Now crimson sleeps the now the petal white.* From "Now sleeps the crimson petal, now the white."

Imagery of carnations, visual and olfactory.

"Crimson" visualized as "pink."

The sounds are good even without meaning.

The sounds of the word "petal" are too light for the rest of the line.

"Crimson" the best sound of all; thinks of English pudding.

Tennyson IX. *To scorning live whereby an alms to work.* From "Scorning an alms to work whereby to live."

Stupid sort of a line; "scorning" a dreadfully "hard" word.

Laborious combination; has internal bodily strains.

Didn't feel that the tapping was at all expressive.

Tennyson X. "And on the mere the wailing died away."

Rather onomatopoeic; but "died" has a little too much movement about it.

Tried to be sad, but did not succeed.

Tennyson XI. "The silent water slipping from the hills."

The word "silent" means distance and seclusion.

"Sliding" would have been better than "slipping" for onomatopoeia; the short "i" is too full of impact.

Too much sound for the sense.

Sounds slightly artificial and banal.

"Slipping" is most annoying; gets no motion out of the line.

Tennyson XII. "And all the coverlid was cloth of gold."

"Coverlid" strangely pleasant for a "k" sound.

Nasal; "cloth of gold" pleasant to say; *but got visual imagery of a scarlet cloth.*

"Gold" the conspicuous word.

Mouth seems very open in the last two feet.

"Lid" doesn't fit in.

Something "insincere" about it.

As typical of the numerical results obtained from the experiments numbered I to XII, we present those for Tennyson. First a table showing the results from the mean of the tapings for each subject arranged both according to feeling-tone and also to the triadic grouping of the experiments as outlined above. In the first column stand the abbreviations for the names of the subjects, and in the last column the averages of the tapings for the pleasant, unpleasant and neutral experiments, regardless of group.

The next table presents the same results *quâ* mean variation. And the third table shows the rank lists which exhibit the acme of the steadiness attained in this whole group of 240 experiments. The mean alone appears to be significant in point of comparison with the general psycho-motor correlations hitherto obtained.

TENNYSON, EXPERIMENTS I-XII. MEAN

Subject	I-III	IV-VI	VII-IX	X-XII	Av.
A. P.	86.3	81.6	87.4	90.0	86.3
U.	—	87.6	89.6	87.7	88.3
N.	—	—	93.5	—	93.5
B. P.	75.8	78.5	—	78.8	77.7
U.	80.1	75.8	79.1	—	78.3
N.	83.8	—	—	—	83.8

C. P.	.....	91.8	87.9	83.5	76.6	84.9
U.	.....	—	—	87.3	—	87.3
N.	.....	—	87.9	—	—	87.9
D. P.	.....	103.8	104.4	102.6	106.1	104.2
U.	.....	98.8	—	96.0	97.9	97.6
N.	.....	—	—	96.8	—	96.8
F. P.	.....	82.0	79.9	83.0	80.5	81.4
U.	.....	77.2	73.0	79.6	—	76.6
N.	.....	—	—	77.0	80.8	78.9
K. P.	.....	56.1	47.9	—	50.8	51.6
U.	.....	—	—	47.4	49.1	48.2
N.	.....	—	—	52.4	—	52.4
L. P.	.....	69.3	67.3	77.1	78.5	73.1
U.	.....	70.2	—	80.9	83.5	78.2
N.	.....	—	—	69.0	—	69.0
M. P.	.....	85.0	87.8	—	—	86.4
U.	.....	85.2	80.1	90.6	85.7	85.4
N.	.....	—	85.7	—	88.8	87.2
P. P.	.....	127.0	131.2	131.7	134.1	131.0
U.	.....	127.9	—	—	—	127.9
N.	.....	—	132.4	—	—	132.4
S. P.	.....	—	113.5	111.3	111.2	112.0
U.	.....	115.6	—	—	—	115.6
N.	.....	—	—	—	—	—

TENNYSON, EXPERIMENTS I-XII. M.V.

Subject	I-III	IV-VI	VII-IX	X-XII	Av.
A. P.	3.7	2.3	4.7	3.8	3.6
U.	—	4.1	3.3	3.9	3.9
N.	—	—	3.4	—	3.4
B. P.	3.9	4.3	—	4.4	4.2
U.	7.1	4.4	5.8	—	5.7
N.	4.5	—	—	—	4.5
C. P.	4.0	4.7	4.6	4.2	4.3
U.	—	—	7.1	—	7.1
N.	—	3.8	—	—	3.8
D. P.	3.8	1.7	1.4	2.0	2.2
U.	3.2	—	4.6	2.8	3.5
N.	—	—	5.6	5.6	5.6
F. P.	4.5	6.0	5.4	4.6	5.1
U.	3.7	4.5	6.1	—	4.7
N.	—	—	4.3	7.2	5.7
K. P.	6.2	5.3	—	6.0	5.8
U.	—	—	6.2	5.5	5.9
N.	—	—	5.7	—	5.7

L. P.	.....	5.1	4.1	4.8	3.7	4.4
U.	.....	3.4	—	3.7	3.6	3.6
N.	.....	—	—	5.1	—	5.1
M. P.	.....	2.4	5.0	—	—	3.7
U.	.....	3.9	4.8	3.3	5.4	4.3
N.	.....	—	4.1	—	4.1	4.1
P. P.	.....	1.7	2.0	1.6	2.0	1.8
U.	.....	2.4	—	—	—	2.4
N.	.....	—	2.6	—	—	2.6
S. P.	.....	—	2.0	3.1	2.6	2.6
U.	.....	—	—	—	—	—
N.	.....	2.8	—	—	—	2.8

TENNYSON. RANK LISTS. EXPERIMENTS I-XII.

Subject	Mean											
A.	e	g	f	d	e	g	g	f	f	g	g
B.	c	d	c	e	d	d	c	d	b	f	d
C.	g	f	g	g	f	f	e	e	e	d	b
D.	h (throughout)										
F.	d	c	d	f	c	c	d	b	d	b	e
K.	a (throughout)										
L.	b (throughout)										
M.	f	f	e	c	g	c	f	g	g	e	f
P.	j (throughout)										
S.	i (throughout)										

MV.												
A.	.....	d	f	e	g	c	e	b	g	e	f	d
B.	.....	h	i	g	e	g	f	e	j	h	j	d
C.	.....	b	h	j	f	h	d	j	b	d	d	g
D.	.....	e	c	d	a	a	a	i	a	f	a	c
F.	.....	g	g	f	j	j	g	h	f	i	h	g
K.	.....	j	j	i	h	i	j	f	i	j	e	j
L.	.....	i	d	h	d	c	i	g	e	g	e	e
M.	.....	f	e	b	i	f	h	c	c	c	i	f
P.	.....	a	a	a	c	d	b	a	b	a	b	a
S.	.....	c	b	c	b	b	c	d	d	b	c	b

Rnj.												
A.	.....	e	g	g	d	b	f	b	f	d	i	d
B.	.....	f	j	e	e	f	g	d	g	g	j	b
C.	.....	b	i	f	h	h	c	j	h	e	f	g
D.	.....	a	b	b	c	a	b	g	b	j	a	c
F.	.....	g	h	h	g	i	i	f	d	h	j	h
K.	.....	j	f	j	i	j	j	e	j	i	d	j
L.	.....	i	d	i	f	d	i	d	e	f	c	f
M.	.....	h	e	d	j	e	h	c	c	c	h	e
P.	.....	c	a	a	a	g	a	a	a	a	b	a
S.	.....	d	c	c	b	c	e	h	i	b	e	d

In the experiments upon Byron and Keats, subject A. was the only one who gave longer tappings for the pleasant than for the unpleasant lines; D., L., and P. do the opposites in both cases;

all the rest of the subjects are apparently inconsistent. In the experiments upon Arnold and Tennyson subjects B. and C. give the longer tapings to the pleasant lines; D., K., M., and P. do the opposite, and the rest of the subjects are again self-contradictory, to a more or less degree. The apparent conclusion is,—new material, new motor manifestations.

Both of the rank lists for the mean (Arnold and Tennyson) are splendid,—indeed, they are rarely ever so consistent thereafter. But the rank lists for the mean variation and the range are not as consistent as they have been before.

From the graphs for this work it was noticed that in every case, the Tennyson experiments took a shorter time to be spoken than did those of Arnold. Also in graphs X to XII appeared much more form quality in the Tennyson than in the Arnold graphs. Even in the final average for all twelve experiments this character is well defined. Again it is concluded that there is something about the sounds or the arrangement of the sounds in the Tennyson experiments which caused the fingers of the ten subjects to move eighteen metres more while tapping the Tennyson experiments than while tapping those for Arnold.

We find also that characteristic feeling-tones, moods and the like are correlated with the type of motor discharge which accompany them. Where one is individual and significant, so is the other. Not only were the Byron graphs indicative of a greater length of tapped strokes than those of Keats, and the Tennyson than the Arnold, but also the general appearance, the steadiness, the form of the graph began at least at the tenth experiment on these poets, and very frequently before this, to take on an individuality as drawn on paper, as much as did the content and quality of the lines as spoken and understood. So that the motor expression we had used, namely the tapping movements of the right index finger, appeared to be not only one that tended toward automatism, but also one that drained away the general somatic supply in a manner characteristic to the poet and fitting to the purpose in hand. A fair analogy to this is found in the case of singers sympathetically accompanying

themselves upon the piano; where the two forms of musical expression are identical, at least functionally, in so many ways as to be regarded as indicative of that unity of the esthetic consciousness which in this particular instance expresses itself in blends of behavior.

To take up each poet or each pair of poets who were experimented upon would be too tedious, and so we shall now turn to a consideration of the rest of these 240 experiments only insofar as they supply data for the main thesis involved in our problem. At the end of the series there appear two very interesting tables, which summarize and focus the matter of the correlations in a very interesting way. One generalization is not out of order in this connection,—the lyrical poets, as every literary man well knows, have employed a phonetic device which the other poets have not; name the lyric poets, and you name the users of liquid sounds in their poetry; name again the lyric poets, and you have named those not only whose lines transmogrify best, but also those who will produce in these tappings, as recorded in the graphs, the finer form quality of the curve of the motor discharge.

At the end of the introspective and other reports of the experiments upon these remaining sixteen poets, we shall consider the graphs for all of them.

Coleridge I. Thũ nāse tã nēēl rĩ tãm dĩn rāde thũ lēēr.

Reminds him of the sound of cymbals.

Sensations cluster around "n" and "s."

Very highly colored sounds.

"E" is conspicuous; imagery of the sea.

Stays in the mouth.

Consonants more prominent than the vowels.

Coleridge IV. Rũ thăd thă bāng tĩs lēēt stā rűsk tĩ pā. From
"Beat its straight path along the dusky air."

Visual imagery of rustic scenery; simple concept.

Sounds run back and forth in the mouth.

Hard to say "sta rusk." Rather quiet sounds otherwise.

Sounds like water gushing and then flowing smoothly.

Something Russian about it; more epic than lyric.

Coleridge V. Rĩ vōze kã strōn sōv mōrst bā fānd thũ wāme.
From "A storm of waves breaks foamy on the strand."

Has a funereal air; imagery of scenes of death.

"Wame" means country life.

Images somebody laboring under a burden.

Felt as if standing at bay, in desperation.

Forceful; hard sounds, but not unpleasant.

Sounds like a strong rebuke.

Coleridge VI. *Thũ zũrv lēs nōom äll blēthēr wıldēn fōge.*

From "All golden with the never bloomless furze."

Some idea of blessing, or piety called up.

Seems like the last words of a narrative of fighting.

Weather and fog and ocean thought of.

Gives a cold and lonely feeling.

Something cloudy and wild and inconsistent about it:

Gives him a "fuzzy" feeling; ghost story.

Wordsworth I. *Thũ rĩn dĩn lāse rā zēem tĩ rĩt thũ tāne.*

Very natural sounds; gives a relieved, placid feeling.

Too nasal; imagery of skipping along.

The whole line a balance between soft and loud sounds.

The "t" sound predominated.

Wordsworth IV. *Thũ grēem thāt brĩllz tōōr zōng ānd hōvez ā thāne.* From "That nature breathes among the hills and groves."

Thinks of the "Lady of Shallott" and of "Launcelot." In spite of the "g" sounds, it seems far forward in the mouth.

Felt in the nose; imagery of fields in a brilliant green.

"Greem" gives a shock; "zong," "toor" and "hoves" bring up bovine concept.

Wordsworth V. *Ov tāthe ĩm tōse rō sĩ hāv lōrs tāl mēēz.*

From "Our souls have sight of that immortal sea."

Recalls moral ideas.

Sounds all pleasant.

Very easy to say; vocalized well; no imagery.

Once almost got a meaning but lost it.

Wordsworth VI. *Hōō krōn thũ sēt wĩth stādz ōv nĩdĩng bōm.*

From "Who crossed the sands with ebb of morning tide."

Sounds important; "kronz" = crowns.

Epical sounding thing.

The "z" sounds very effective.

Shelley I. *Nĩd rēn dāt rũl tāl mēēd rũn tēs thēr nũl.*

Every foot pleasant, but the line disconnected.

Front of the mouth used.

Sounds do not fuse; each foot is distinct, yet smooth.

Sounds gloomy and melancholy.

Surprised because it went so smoothly; especially since all the sounds are short and emphatic.

"Ther null" meant "thermal," "diurnal"; very resonant.

The "d" and "t" sounds predominate.

Shelley IV. Whěn sǒv thǔ něsh dōl grěss hēr thǒn thǔ rēē.
From "When on the threshold of the green recess."

Mediocre poetry; the "s" sounds mar it again; "sov" makes the lips come into focal consciousness.

Very strong rhythm.

Lyric sort of a thing. Visual imagery of out doors.

Shelley V. Bē quǐvǐng thēēnērd zārm our twītēr nīn. From
"Quivered beneath our intertwining arms."

Refers to some very romantic scene.

Something akin to coquetry thought of; slight sexual feeling connected with it.

Arouses many emotions.

"Twiter" particularly pleasant.

"The R sounds prominent."

Shelley VI. Thǎt flōgy lōōth ūp lēngērz mǐv āt rōn. From
"At length upon that gloomy river's flow."

"Flogy" seemed sexual; conscious of the roof of the mouth.

"Flogy looth" is a lovely, slippery combination; thinks of seaweed on the rocks.

The "g" sounds suffocate.

Gives that feeling of uneasiness one has when shadowed.

Marlowe I. Rīn tēn thǔ rīle dǎ zāde ūt sī thǐ nēt.

Great variety of sounds in it.

Seems to occupy the middle of the mouth cavity.

Very little buoyancy or warmth.

Something explanatory; expansive feeling.

Marlowe IV. Thǔ dēnchīlz quāre īn chēvlēss fānez ōv thīre.
From "The devils there in chains of quenchless fire."

Feels lips touching eye-teeth; thought of something tragic or mock heroic.

Forceful sounds; thinks of "fame," "Macbeth," etc.

Very energetic and sturdy; sounds forward in the mouth.

Epic line; invites bellowing.

Marlowe VI. Thǔ wūrj ōr tēkt bē drōōt nǎ sēr drǎ mūrld.
From "Be termed a scourge and a terror to the world."

Seems around the front of the mouth.

Thinks of the growling of a lion; wild and forceful sounds; they fill the mouth full.

Too many consonants; feels like being whirled about in a circle and left breathless.

Sounds like angry swearing.

Cowper I. Nūd rās tī nīl mǎ zēt rīn dēs dū rǎn.

Tiresome, disconnected sounds.

Seemed to be inhibited.

"If said low and quietly, it was pleasant."

Gives an attitude of confidence.

Sounds like the narrative of a traveler.

Cowper IV. Thũ nẽm thấ hĩfẽ ấs vãn dĩ mēēdz ấz dĩrẽ.
From "The deeds that men admire as half divine."

Located at the lips; kinaesthesia the basis of the pleasure.

Gives a vague idea of something confidential.

The "ad van" very prominent.

Cowper V. Wĩth nẽrn ỉ pĩd ấnd ẫs kỗn tĩ rẫ nẫd. From
"With mad rapidity and unconcern."

Has a silly and foolish meaning.

Located forward in the mouth; imagery of indefinite activity.

Prevalence of short vowels noticed.

"Us" is peculiar to accent; this the focal point.

"Pid" balks one; induced a feeling of spunkiness.

Cowper VI. In shũrz rẽ kỗzemẽnt zũv thũ fỗrẽ hẽ lẽnt. From
"Incurs resentment for the love he shows."

Feels it located back in the mouth.

Not very energetic; gives a cool effect.

Milton I. Thũ rĩl tĩn lēẽt rẽ tĩsẽ dẫ nẽd nũ rỗ

Front part of the mouth in consciousness.

First two feet give a sense of levity, last two, gravity.

Not emphatic, but most agreeable and lovely; gave many pleasant thrills.

The "t" and "n" sounds tended to interchange.

Milton IV. The dĩz ấnd tĩld yỗỗ wĩs shũn wẫ mẫl sẫtẽ. From
"The dismal situation waste and wild."

Thought of the words "wistful way."

The sounds feel frigid; imagery of a cold country.

Very easy to say; sounds like an oration.

Milton V. At bỗzẽ hẽ chẫn tẽl mẫst hĩz twĩlt ấnd rỗỗl. From
"At last he rose and twitched his mantle blue."

Suggests early English romanticism; maybe fighting; feels as if the front of the mouth alone were used.

Calls up Scotch scenery.

Trace of quiet and melancholy in "bloze"; rhythmic.

Calls up some martial attitude.

Milton VI. Mẽ tẫsẽ ỉ lẫwt mĩ sount ẫs pẫzẽ ẫd thẫw. From
"Methought I saw my late espoused saint."

Very conscious of the mouth sensations.

A quiet, peaceful description.

Rossetti I. Nĩ rĩl thũr dẽtẽ zẫ mẫs rũt lẽ dĩ rĩn.

Kinaesthesia rather forward.

Not musical, but impressive
 Felt as if "mes" and "rin" were light spots.
 Perhaps a description of nature; "t," "d" prominent.

Rossetti IV. Tōō nūdz tēn sprōle tōō zīng thīs gīne sēt wēs.
 From "Tonight this sunset spreads two golden wings."

Rhythmical; imagery of a sunset.
 "Too zing" and "set wes" charming.
 Seems like walking haltingly; five separate feet.
 Feels like setting his teeth.
 "Z" and "s" quite prominent.

Rossetti V. Thū wēd ōv dīnth īm sēr īsh wūble pīng. From
 "The wind of death's imperishable wing."

Mysterious and humorous.
 Kinaesthesia goes from the throat to the lips and back. Imagery of some
 red scene in nature.
 The last three syllables seemed strangely inadequate.
 Seems like climbing a hill to a level path.
 Warmly emotional, but no meaning.

Rossetti VI. Thū shounding nīse thū soudz ā rīte thū lōre.
 From "The sighing sounds, the lights around the shore."

More magnificent than pleasant; visualizes Niagara.
 Thinks of the roar of water; sounds dental and palatal.
 Thinks of an enormous wide ocean.
 Description of an imposing natural scene, either mountains or the sea.

Shakespeare I. Thū trēl tīn rād nūr tīn dāt sī thū nāl.

Sounds musical and rhythmic.
 Seems to lie in the forward part of the mouth.
 Has a latent meaning of some kind; very musical.
 Very light and lyric.
 Melodious; firm sounds, yet not obtrusive.
 "N" and "t" prominent, but not hard this time.

Shakespeare IV. A krēē zēn swēv thāt zī ēst hōte īn flāre.
 From "A crow that flies in heaven's sweetest air."

Seems all in the roof of the mouth; visual imagery of a stream, also of flame.
 Too many "z" and "s" sounds.
 Thinks of some national affair, such as "conditional dependency."
 Seems to be a description of a big fire.

Shakespeare V. Thū prīme hēr kōv zāl būr lī pā krī vūll
 From "Calls back the lovely April of her prime."

Kinaesthesia not localizable. Every iambic is an isolated meaning.
 Pitch rises to the middle and then descends.
 Very mysterious and splendid.

Shakespeare VI. Mē kloum hăth rēet him frask thū now jūn.
dōm. From "The region cloud hath masked him from me now."

Seems to describe a little animal freeing himself.
Kinaesthesia elusive; something energetic about it.
Seems to describe the frisking of a clown.
Describes a jolly May festival on the very green grass.
Very amusing; burlesque; anticlimax;

Spenser I. Rīn dēer dū nīs tā mīte nūz rēl rī dēen.
Felt in the front of the mouth; likes R, M, N, and V.
Hard to say; feels as if the sounds were projected from the mouth.
Nasal, especially the "d-n," "n-d" combinations.
Queer; sort of an old fashioned dignity about it.

Spenser IV. And dīng ōv tīns ānd sā dīs lēn tūl jēēdz. From
"And sing of knights' and ladies' gentle deeds."

Superficial and humorous; his mouth seemed to wear a grin.
"Couldn't get it out of the back part of his mouth."
"Z" too prominent.

Spenser V. Bē dōle ā lā hīm fīdly vūr dī sāre. From "A
lovely lady rode him fair beside."

Located forward in the mouth.
Smooth; a ballad of some sort; love poetry.

Spenser VI. Thār dēz ēl wūd ā hāp ī chōlī fī. From "There
was a holy chapel edified."

Something rather profound indicated by it.
Seemed forward in the month.

Browning I. Nīt rāse tēth nāl rāl dēet thīs mās nūs rāne.
Emphatic and slightly humorous.
All feels in the front of the mouth.
Requires more mouth movement than is normal.
Tends to get a little cumbersome.

Browning IV. And blēm thū vēē dē tōs tēr hās thū mūr. From
"And hear the blessed mutter of the mass."

Sounds on the lips mostly; thinks of ocean and the mermaids.
First amusing, then unpleasant.
"Blem the vee" is swearing.
Arouses feelings of disgust, possibly scorn.
Sarcastic meaning.

Browning V. Hē kūl tānt īb rē thōo nēs pūr thū līz. From
"He threw reluctantly the business up."

Sounds in the front of the mouth; unpleasantly comical.
The sounds do not go together.
Very commonplace description.

Browning VI. Năd rī vōōk ȳl tēn thōr hăb tē thŭ sōn. From
 "And I have written three books on the soul."

Sounds in the middle of the mouth.
 Certain warm quality about the sounds.
 Seemed to demand a rapid reading.

Pope I. Nĩ rŭn thŭr tĩl tŭ zēd răs nŭs nĩ rĩt.
 Has a nasal twang.
 Tip of tongue used too much; not rhythmic.
 Too many "n" sounds; gets tongue-tied.

Pope IV. Thŭ shŭrn ō blēke hĩz nŭslĩ stōōbĩng rā. From
 "The sun obliquely shoots his burning ray."

Gives a cold, unhappy sort of feeling; thinks of snow.
 Smooth and rhythmic; thinks of a windy, sunshiny day.
 "Nusli" and "stoobing" very bad sounds.

Pope V. Thŭ loundĩng săts ĩn rōōp ěx tŭr dēr tōr. From
 "The troops exulting sat in order round."

Thinks of a camp fire and of baking.
 Sounds like a title to something odd.
 Jerky and full of irregularities.

Pope VI. Thŭ snoud ănt kēēs mŭ sēn ōs tōō thŭ mēs. From
 "The sound must seem an echo to the sense."

Thinks of forced punishments.
 From the sublime to the ridiculous, Foot I to V. Here the sibilants are
 not unpleasant.
 Sounds like a sarcastic remark.

Jonson I. Nĩt lĩn thŭ tă răn dēs dŭ thāne tĩ rĩl.
 Full of dentals; feels tongue pushing about vigorously.
 Kinaesthesia at the hard palate forward.
 Fairly smooth and open; forward in the mouth.
 Visual imagery of bright colors, no objects.

Jonson IV. Ōr krăngthēr hēst hēr măt ă rĩstăl rēbe. From
 "A crystal mirror hangeth at her breast."

A romantic note to it.
 "Krangther" called up a blacksmith shop.
 The "r" sounds very prominent.

Jonson V. And moice hēr vīke ĩz trĩlpēt shroud ă lŭll. From
 "Her voice is like a trumpet, loud and shrill."

Depressing, heavy and dark; cannot tell why.
 Flowing and easy; visual imagery of a foggy sea.
 Thinks of Vikings and pirates.
 Dislikes the tonal anticlimax.
 Cannot explain why it should be so full of effort.

Jonson VI. Hēr thrēst mā hē nī yōō shānd bārt hēr sōōr. From
 "And you may see her heart shine through her breast."

Sad and depressing; gives a feeling of helplessness.

Seems to be slightly threatening; the "r" sounds prominent.

"Shand" dominated the whole line.

"Threst" very pleasant.

Might well be a continuation of IV, and V.

Dryden I. Nū rīn tīth lō rād sēte rī līd nū rāne.

Seems nasal all through; felt damp and wet.

Localized exactly in the middle of the mouth.

The "n" sounds are rather nasal.

Too many of the same sounds caused inhibitions.

Narrative, business like, but not strong.

Felt as if he had been in a damp forest.

"Tith lo" the pleasantest sound of them all.

Dryden IV. Tōō rōld īn lūre tōō stāve thū rūse rē tō. From
 "Resolved to ruin or to rule the state."

It describes some vigorous historical action.

Thinks of Napoleon addressing his troops; "r" did it.

Located extraordinarily far out of the mouth.

Gives a sense of argumentation or exposition.

Suggests melodrama and a villain.

Describes some one's activity.

Dryden V. Thār krēllēn zāll nōōs wīkērz wāde thū rēne.
 From "Their cries soon awakened all the dwellers near."

Related to a scene of action; intellectual poetry.

Imagery of some majestic excitement; "r" does it.

Imagery of a sailing boat, activity; sounds placed back in the mouth.

Gets a sensation of floating.

Imagery of something flowing.

Thinks of a ship sailing out of the harbor.

Dryden VI. Dī voundz thār tīshōnz thīd ānd nōō pār bīde.
 From "And thin partitions do their bounds divide."

Seems to describe some great hurry and excitement. Gets a ringing in his ears.

Seems common and vulgar; the activity has faded out.

The last iambic drops perpendicularly.

Something determined and emphatic about the line.

Swinburne I. Nād rēn dōr lēse thū tā rīt zēde nāt rēl.

Smooth, and well placed sounds.

Conscious of the roof of the mouth.

Easy to say, but "zede" disturbs.

"T," "d," and "r" prominent.

Swinburne IV. *Dūse pāwd hīts wāle hē blūz rāth wārd pēr slēēm.* From "Deep sleep hath warmed her blood through all its ways."

Distinct visual imagery of a fleeing horse.

Thought more and more of a blustering, angry man. Rhythm changed from jerky to smooth and regular.

Sounds like a long list of slang words.

Variety of tonal effects in the line.

Swinburne V. *And nā wēte zāre īng loi sōv tīng thū nīs.* From "And noise of singing in the late sweet air."

Glimpses of Polish scenery in the imagery.

Suggested some love scene; serenade, or sweethearting.

The long vowels have a warmth about them.

Thrills in the body at "na wete zare. . ."

Swinburne VI. *And rast thū vīngyēr pānd thū spōtērd wīn.* From "And past the vineyard and the water spring."

Feeling of action and strength.

Kinaesthesia very interesting, but cannot locate it.

"Yer" sounds vulgar.

Sounds scratchy, metallic and rasping.

"Yer" made the whole line seem slangy.

Gray I. *Thū lēre nī dāse rā tām dī nāse tū lē.*

Rhythmical and smooth; sounds like Scottish poetry.

"Di nase" to nasal.

"R," "t" and "d" prominent.

Gray IV. *Tōō lē thū mawn dūp mūs lān ūt thū pōn.* From "To meet the sun upon the upland lawn."

Visual imagery of a brook and a sunrise.

Has a feeling of eating something soft; "l" the prominent sound, calls up imagery of water.

Imagery of sky, moon and clouds; sounds rather nasal.

Description of rural scenery.

Gray V. *Thū hūrpērz hēkelī zāre ānd mō yōō spēd.* From "And spare the meek usurper's holy head."

Visualizes a scene of activity in the harvest fields.

Rather throaty; thinks of crickets chirping.

Imagery of the mown hay.

Flows together; visual imagery of reapers.

Describes some monotonous activity.

Gray VI. *And sāre thū dēz īts wōnērt stānēss wēte.* From "And waste its sweetness on the desert air."

Gives a tinge of sadness; does not imply activity.

The line is as smooth as water; seems very dental, too.
 Seems like running down hill; sibilants prominent.
 Short "o" and long "a" do not fit together.
 Could be easily memorized; "wete" a very comical ending.

Sydney I. Thũ rā nă sīt rē vŭn tĩth lē nũ rāle.
 In front of the mouth more than in the back.
 Lyric quality; yet somehow hard to say.
 Cannot be said very rapidly.
 Tonal warmth about it.
 The vowel sounds predominate.

Sydney IV. Hē wŭnz my hōne ĩt wōz hĩz lārt fōr zŭv. From
 "He loves my heart, for once it was his own."
 Rhythmic and easy to say; narrative; sexual ideas aroused.
 Sweet scenes between lovers thought of.
 Sounds like gossip.

Sydney V. Wĩth plēē ture nāzed kōn tēz ěnt cāse wĩth prēnt.
 From "With nature pleased, content with present case."
 Thinks of wooing, pleading and the like.
 Thinks of the links of a chain.
 "Nazed" is a participle.

Sydney VI. Thũ nōōr nō wĩz thũ sēlth rē prēēl zām pērz.
 From "The poor man's wealth, the prisoners' release."
 Very smooth and rhythmic; might be a deprecation.
 Had to pause after selth."

Of all these twenty poets, Byron, Keats, Arnold, Tennyson, Shelley, Shakespeare, Coleridge and Wordsworth show best in the rank lists, and their effect on the introspective consciousness was quite superior to that made by the other eight poets.

The table next to be given needs some little explanation; across the top of the page are written the abbreviations of the ten subjects who took part in the work; the column at the left contains the names of the twenty poets experimented upon. Below the abbreviations of the subjects' names are found three columns with the figures 1 and 2 in various positions under the symbols

P P U
 —, — and —. The numerator of these verbal fractions is re-
 U N N

ferred to by the number 1 in the columns below them, and the denominator is referred to by the number 2 in the same columns.

Now when the $\frac{P}{U}$ column has a number 1 in it, it means that the

average of the tappings for this or that subject were greater for the pleasant (P) experiments than for the unpleasant; when there is a 2 under this verbal fraction, it means that the unpleasant experiments produced the greater motor discharge. And the

same for the figures under the symbols $\frac{P}{N}$ and $\frac{U}{N}$,—when there

is the figure 1 under $\frac{P}{N}$ it means that the averages of the tappings

for the pleasant experiments were greater than for the neutral, and the same way throughout the other symbolic representations.

So that we have a concise summary of the correlations between the feeling tone and motor discharge for these 240 experiments, with respect to the mean of the tappings, all on this one page. If we ask, then, who are the absolutely constant subjects, the answer is that they are in the null class; for in every vertical column we find the ones and the twos scattered all through, with only tendencies of one kind or another looming large. Where there are no figures in a column, it means that there were not enough different judgments to make a correlation: for example, there were in A's judgments on the affective value of Keats' poems, no neutral predicates attached to the experiments, and so on. In D's judgments on the Shakespere experiments, there were only one kind of predicates given, and so in the columns in which there are no figures for a certain poet, we have slight basis for correlation.

Following this page, we have another table, which shows the same correlations over again, and also the correlations between the mean variation and the feeling tone; the figures mean the same as before, and here one can see a very much better correlation than with the mean alone. This is the conclusion: that upon consideration of the preponderance of twos in the first two columns, our former statement is again verified, that it is not the pleasant experiences in these experiments which call for the greatest amount of motor discharge, but the unpleasant and the neutral.

Subject	A.	B.	C.	D.	F.	K.	L.	M.	P.	S.
Poet	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN
Keats	1	2	2	2	2	1 1 2	2 2 1	2 2 2	2 2 1	2 1 1
Byron	1	1 1 1	2 1 1	2	1 1 2	1	2 2 1	2 2 2	2 2 1	2 2
Arnold	2 2 2	1 1 1	1 1 1	2 2 2	1	2 2 2	2 2 2	2	2 2 1	1 1 2
Tennyson	1 1 1	1 1 1	1 1 1	2 2 2	2 2 1	2 1 1	1 2 2	2 1 1	2 1 1	1
Wordsworth	1	1 1 1	1 2 2	2	1 1 1	2 2 2	2	2 2 2	2 2 1	1
Coleridge	1 1 1	1	1 1 1	2	1	2 2 1	2	1	2	
Marlowe	2 1 1	1 2 2	1 2 2	1	2 2 1	2	2 2 1	1 1 1	2 1 1	2
Shelley	1 2 2		2 2 1	1	1 1 2	2 1 1	2	1	1 1 2	1 1 1
Milton	2 2 1	1 2 2	1 2 2	2	1 2 1	1 1	2	1 1 1	2 1 1	2 1 1
Cowper	2 2 2	2 1 1	2 1 1	2 2 1	2	2	2 2 1	1 1 2		1
Shakespeare	2 2 2	1	1		2 2 2	2 2 2	1	2 2 2	1	1 1 2
Rossetti	2 2 1	1	2 2 2		2 1 1	2	1 1 2	2	2	1
Browning	2 1 1	2 1 1	2 1 1	1	2 2 1	2 2 1	1	1 1 1	2	1 1 2
Spenser	2 2 2	1	2 1 1	2 1 1	2	1	2	2	1 1 2	2 2 1
Jonson	2 1 2	1 2 2	2 1 1	1	1	2	1	2 2 2	2 2 1	1 2 2
Pope	2 2 1	2	2 2 1	1 1 1	2 1 1	2	1 1 2	2 2 2	2 2 1	2 1 1
Swinburne	1 1 2	1 2 1	2 1 1	1	2 2 1	1 2 2	1	1	2	1
Dryden	2 2 1	2	2 2 2	1 1 1	2 1 1	2 1 1	1 1 2	2	2 2 1	2 2 1
Sydney	1 1 1	1 2 2	2 2 1	2	2	2 2 1	1	2 2 2	1	1 1 2
Gray	1 2 2	2 2 2	2	1 2 2	2 2 1	2	1 2 2	2 2 2	2	1

Subject	A.	B.	C.	D.	F.	K.	L.	M.	P.	S.
Poet	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN	PPU UNN
Keats .....M.	1	2	2	2	2	1 1 2	2 2 1	1 2 2	2 2 1	2 1 1
Byron .....Mv.	1	2	2	1	1	1 2 2	1 2 2	2 2 1	2 1 1	1 1 2
Arnold .....M.	2	2 2 2	1 2 2	2	2 1 1	1	2 2 2	2 2 1	2 2 2	1
Tennyson .....M.	1	1 1 1	2 1 1	2	1 1 2	1	2 2 1	2 2 2	2 2 1	2
Coleridge ....M.	1 2 2	2 2 2	2 2 1	1 2 2	2	2 2 2	2 2 2	2	2 2 1	1 1 2
Wordsworth ...M.	1 2 2	1 1 1	1 1 1	2 2 2	2 1 2	1 2 2	2 1 1	1 1 2	1 1 1	1
Shelley .....Mv.	1 1 1	1 1 1	1 1 1	2 2 2	2 2 1	2 1 1	1 2 2	2 1 1	2 1 1	1
Marlowe .....M.	1 2 2	1	2 2 1	2	1	1 1 2	1	2	1	2
Cowper .....M.	1 1 1	2 2 2	1 1 1	2	2 1 1	2 2 1	2	2 1 1	2 2 2	1
Milton .....M.	1 1 1	1 1 1	1 2 2	2	1 1 1	1 2 2	1	2 1 1	2 2 2	2 1 1
Rossetti .....M.	2 1 1	2 2 1	1 2 2	1	2 2 1	2	2 2 1	1 1 2	1 1 2	2
Shakespeare...M.	2 2 2	1 2 2	2 2 2	2	2 2 2	2	2 2 2	2	2	1
Spenser .....M.	2 2 2	1	2 2 1	2 2 1	2	1	2	2 2 2	1 2 2	2 1 1
Browning ....M.	2 2 2	1	2 1 1	2 1 1	2	1	2	2	1 1 2	2 2 1
Pope .....M.	1 1 2	1 2 2	1 2 2	2	1 1 1	2 1 1	2	1 1 1	1	1 1 2
Jonson .....M.	2 2 2	2 1 1	2 1 1	2	2 2 1	1	2	2 1 1	1 1 2	2 2 2
Dryden .....M.	2 2 1	2	2 2 1	1	2 1 1	2	1	1 1 2	2 2 1	2 1 1
Swinburne ...M.	2 2 1	1 2 2	2 2 2	1 1 2	2 2 2	2 2 2	1 2 2	2 2 2	1 1 1	1 1 1
Gray .....M.	2 2 1	2	2 2 2	1 1 1	2 1 1	2 1 1	1 1 2	1 2 2	2 2 1	2 2 1
Sydney .....M.	1 1 2	1 2 1	2 1 1	1	2 2 1	2 2 1	2	1	2	1
Gray .....Mv.	1 2 2	1 1 1	2	1 2 2	2 1 1	2	2 1 1	1 2 2	1	2
Sydney .....M.	1 2 2	2 2 2	2	1 2 2	2 2 1	2	1 2 2	2 2 2	2	1
Sydney .....Mv.	1 1 1	1 2 2	2 2 1	2	2	2 2 1	1	2 2 2	1	1 1 2

The same features were noticed on the graphs for the last sixteen of these poets as were brought to our attention before;—the more and more meaning the line of poetry contained, the finer and finer was the form-quality of the graph as drawn on these plates; experiments X to XII for every poet show the same effects in these drawings,—the first foot of the line and the last foot of the line called for a greater motor discharge than did the intermediate feet. Particularly irregular were some of the graphs, especially those of the less lyric poets; and it not infrequently happened that the rearranged line was provocative of a less regular and rhythmic effect than the transmogrifications which preceded it. Indeed, the experiments numbered VII to IX were not very much enjoyed by the subjects, but, having begun that way, it was argued as a better policy to continue to the end in the same manner as we had begun, so as not to spoil the symmetry of the work.

With nine of the twenty poets experimented upon, the same material was used in experiments III to XII. Thus we had both introspectional and graphical results upon the same tonal content of poetry cast into three forms,—transmogrification, rearrangement, and full meaning. Introspectively, however, the results were not equal: frequently the transmogrification would be pleasant, while the other forms were unpleasant, and vice versa. When this occurred, however, the graphing showed analogous changes. And when the position of a strong consonantal combination was transferred from one part of the line to another, in the same way the graphings showed a shift of accent in the same direction. That tonal replicas were obtained in the transmogrifications without betraying the meaning was evidenced by the fact that in many of the cases the two forms in which the line stood were associated together by the subjects of their own accord. Transmogrifications also always preceded those lines from which they were taken in order of presentation.

Insofar as the graphing of the 81 experiments for those poets whose single line experiments were repeated three times in three different forms were concerned, the results showed that the ex-

periments X-XII always took the shortest time to be spoken, which is quite natural, since they are in the English language; the rearrangements take the next longer time, and the transmogrifications take the longest time to be spoken. There are special cases where the three graphs are very close together, and again other special cases where they are very far apart from one another; Spenser, Cowper, Pope and Milton illustrate the first tendency, while the rest of the poets, more or less illustrate the second. There are also great differences in the angle of inclination of these graphs from the horizontal axis, which is greatest for those experiments which were the most puzzling and the most difficult to recite and introspect upon.

TRANSMOGRIFICATION OF LARGE PASSAGES OF BLANK VERSE

We now turn to the experiments concerned with the psychomotor effect of large passages of poetry. These are numbered XIII, XIV, etc. The plan was as follows: to find a ten-line passage of blank verse containing nothing but iambics,—this to be called No. XIII for each poet. Experiment No. XIV transmogrifies this same passage. Experiments XV *et seq.* are concerned with the effect of other than blank verse lines, namely rhymed passages and shorter or more irregular verse forms than the heroic blank verse.

It was very difficult to construct these XIV experiments; it was also very difficult to find the XIII experiments;—in several cases larger passages than the ten lines we used were boiled down to make them, and often it was tedious and slow work; we may have done injustice to some of the poets,—certainly now and then the succession of iambics is doubtful, as in the Arnold XIII experiment. But any one who tries to find ten lines of blank verse poetry without an alteration in the feet, will be persuaded at the end of his search to withhold severe criticism upon the selections of poetry we have made.

To transmogrify these XIII experiments we first wrote the poem on a large card marked out in small squares, indicating the accented consonants and vowels in red ink, and the unaccented in black; the card was then cut up, a line at a time, and the trans-

mogrification was accomplished by uniting the scattered elements again with the tonal pattern of the poem in mind and the injunction to avoid making words or suggestions of words in the tonal product that resulted.

We never presented experiments XIII and XIV for the same poet on the same day; and since intervals of a week elapsed between the presenting of experimental material to the subjects there was little danger that they would recall the work of the week previous; these experiments were presented in the order in which we give them, one of the XIII and one of the XIV on the same day; it was at the close of the hour, also, after the single line poems had been treated experimentally. A brief period of rest was given before we attempted this heavy work, and since the subjects had been tapping for thirty minutes, with rests, the practise curve for the day was not likely to show in these experiments.

Two preliminary experiments of this sort were tried before it was determined to carry the experimentation in this direction. The poets selected were Coleridge and Keats.

The poem from Coleridge so treated was the "Ode to the Departing Year." The first sixty-five accented and the first sixty-five unaccented sounds were employed. For the benefit of a tonal comparison of the original and the transmogrification, we print them both:

Original:

Spirit who sweepst the wild harp of time!
It is most hard with an untroubled ear
Thy dark inwoven harmonies to hear! etc.

The transmogrification:

Thũ spärd öf tēēp ĩt swēē nĩth ăn ěst wärp
Mō trĩme ĩt zărk whōo hĩld thũ wēēr ũld ōv
Ōst ĩb nĩ dărd wũ năr tōō rēēs ĩn ēēm
Thět ěvĩng clāfe ōn ĩxtēns mōng ē mōr
Ī rēē tăl chōlds ěn fēēnj ěnd frĩn yăd nĩme
Frēn hō dũm stĩnd ĩts trăv ērd lĩnd ěss răf
Bũ tĩm ĩts wĩst lĩ nōnd ĩng fĩme thũ nărt

Ī rād nēss mōrf ĩng lārt thū lēn ōv stēē
 Nīth ěnt ěn tō lī sīle dē wou dēss āth
 Thū clīt ērd mō hēnt clōn ĩng sāpe nī pāzd
 Whā rēt mī flād the frōng mūr sōl wānd rīth
 Wīm fēēs Ī mōzd ōr yī tēnt nīzd ā mōōt
 Thū hī fous hēss ēr stī ěm yō hīs sūl,—

One difference that will be at once noticed between this and the original is that here we have nothing but iambs, while in the other the feet do not remain so regular; neither is there anything in the transmogrification but decasyllabic lines, which is by no means the case in the poem Coleridge wrote. But our rhythm and line form was unchangeable for methodological reasons.

The subjects were all handed this experimental material printed and with the accented syllables marked with a red accent-stroke. They were not told what it was; each one read it over until the pronunciation was well learned, usually four or five times; no pauses were allowed, since we wanted the fresh impression to go into the introspection. When they felt sufficiently confident, the lines were recited and tapped as all the previous experiments had been.

This is the introspection:

Subject A. (We shall omit the feeling tone judgments in this series, for they were all pleasant.) Rather tragical and solemn; organic sensations of a marked character appeared all through the reading; felt that something was impending and tried to shake off the feeling, but couldn't; line four is the important line,—it is very descriptive of some battle or personal conflict; don't know exactly what it means, but it is very gloomy and depressing; sounds foreign and the imagery of some cold climate was aroused.

B. Imagery of a dark cloudy evening on the wild moor; something fatalistic about it; wind seems to be blowing, some traveler is hurrying to obtain shelter; auditory imagery of the sea, which is stormy and fierce; line four seems to reach some climax, and there is a secondary climax in line eleven; I think of Schopenhauer's philosophy and of some of Byron's poetry, but this is more sincere than Byron; organic sensations of a compelling sort; the whole feeling is intensely romantic and mournful.

C. Did not get as good imagery out of it as it seemed to

promise; romantic and forceful; seems to be a description of some battle or of some scene in which there is conflict.

F. Imagery of some wild scene, maybe at night; line four indicates some clash between persons or things; very romantic and at times solemn and heavy poetry. The last line does not seem to belong to it at all,—the “s” in “hesser” rather spoils the dignified effect of the other lines.

L. It's tragic. There is depicted a scene of the middle ages or some dark tragedy of some sort; very heavy and important thing, and someone is describing either his own deeds or those of another in a very emotional way; some of it is soft and persuasive, and gives variation to the heavier parts; it's all very much in earnest; very full of activity and force,—might be from *Othello* or the other Shakespearean tragedies.

N. Very powerful thing; means some tragedy or heavy and intense situation; line four is where something dismal happened,—some battle described. “Bus tim its wist,” in line seven gives the effect of something conciliatory, or as if one should say, “Well, I accept it, if it has to be so,” or something like that; gives a deep sound while saying it; but it lightens slightly at the end.

T. Very mournful and sad; almost oppressive; somebody seems to be grieving over some loss or some calamity; at line four there is a feeling that the fatal moment is reached and there is nothing to do but to endure what is to come; the whole thing sounds slightly barbaric, and Teutonic; might refer to Scandanavia and the Norsemen; seems to refer to men rather than women.

W. It gives a rather light and pleasing effect(!) Thought of a lot of animals; seems to refer to something other than myself, and to be out of doors.

Z. Very dignified and tragical; refers to some dreadful calamity and almost to a gruesome deed in the dark. Imagery of wild country and wilder ocean; all imagery of a dark gray color, and auditory images of the sound of the waves and the wind; highly enjoyable sensation altogether; something seems to be inexorably moving and pushing all before it; line four is where something fatal happens; the rest is not so tragical, but it all seems to belong together.

Y. Almost doleful; certainly tragical and intensely romantic. Means much; imagery of some ocean scene where a storm is raging; everybody is in a state of great fear, and is hanging on for dear life; this is in the first part; the last part is more hopeful. Perhaps it is taken from some one of Shakespeare's tragedies. It certainly couldn't be any light, lyric poetry.

In order to make a comparison between the motor discharge obtained in the above experiment and something else by which it can be standardized, we shall take the next experiment of this sort, the Keats-transmogrification, which again every one of the ten subjects found pleasant, though W only slightly so. Here in each case, we have no possibility of correlation between feeling tone and motor discharge, but only upon the basis of what sounds were employed in each experiment, and see whether, for example, the short vowels or the long vowels give the greater motor impetus, and whether certain consonants seem to have more effect than others in this matter.

The other transmogrification was constructed out of Keats' "I stood tiptoe upon a little hill." We employed the first fourteen lines in which there are more unaccented syllables than accented, though the accented sound elements outnumber the unaccented, as is the case generally with Keats as well as most of the English poets. In making the transmogrification of the above passage, these supernumerary sounds had to be omitted; so did the rhyme, as a matter of course, and hence the effect of both fourteen-line passages of sound is not quite the same. Yet the introspection seemed to neglect these differences.

The transmogrification of this poem of Keats:

Ing lööd Ī pō pīt tīll ā vīlly stōn
 A stōōk ūl rīt sā wānd ū stō thū rā
 Sū hēm whēēt bīde thū prīth ēst ōōds swīch ōd
 In wōōp ūl drānt īng lāt ā thūrv īng sānt
 Pīng slēms lī kīde ā sklēēv rānd fīde lī prat
 Thād stōn yāte ōst ōze nār thū tīāmēds
 Mōrf stāwt ĩ hērl thū löd īng sōōv thū nōr
 Nānd owds ōō mērb hās flōsh thū clōōry pōrn
 Thānd whyks crēēl tēsh wū frēēt lī brōm ā slōōk
 Thū swōn ū blēpt thē frēn ōv hēēldz ē crēv
 Thū lēpt lēss foiz ānd oiz nār thīt ēl Ī
 Thōv ōrn ā vōng ēns bēēl thū mēēvz ā sīl
 Thū hērī fāvz nāt sōnt ōr mōt thū sōōd.

In line eleven one finds an alliteration "foiz and oiz," and line nine is not free from enunciation difficulties, but the above ar-

rangement of sounds was the best that could be done at the time. It was, for some reason or other, much more difficult to keep words from forming in the making of this transmogrification than in the case of the rearrangement of the Coleridge Ode. This one took longer, and more changes were made in it before it was finally presented. Rhymes are particularly troublesome things to handle,—the danger of alliteration is great, for they must be used as near to each other as possible, if one wants to keep the thing a tonal replica of the original.

The subjects gave the following introspections:

A. Slightly humorous thing; very peculiar sounds reminding me of something playfully done; visual imagery of an outdoor scene, quite full of color; whenever the long "I" occurred, it made me think that someone was telling what he had done, but it did not seem very important; this whole combination of sounds less solemn and effective than the other (Coleridge). Something rather quaint about it all.

B. It puts me in the midst of some natural scene, where there is quite a little animation; nothing heavy at all, might be in spring or summer; makes my mouth feel just a little bit puckered, all the sounds seems to cause much movement of the lips; it is not a very deep or profound thing,—just a sort of playful and slightly humorous affair; nothing philosophical in this passage as there was in the other one.

C. Seemed as though it ought to have been easier to say than the other one, and it reads easier to the eye, but when I came to say it, it bothered me more; I don't get much imagery out of it, but it all seems rather light and gay, in spite of the fact that it is hard to read; so many unusual and almost laughable combinations in it.

F. Gives a very peculiar feeling; half humorous and half otherwise; rather romantic and a little Spencerian in places; "the swon u blept" makes me think of Lohengrin and other fanciful characters of mythology; rather much ado about things of very little real importance. Some visual imagery of pastoral scenes, shepherds and lasses and the like.

L. Romantic, curious sort of a thing; not at all heavy like the last one, but pleasant on other grounds; visual imagery of some quiet scene in the fields, in spring; everything is just slightly moving and nothing very much is the matter, though now and then somebody seems to be making or trying to make important

that which is not so; parts of it are soft and dainty, such as "thuleptless foize and oize."

N. Dainty and light; reminds me of a bird cocking its head from side to side and chirping slightly; visual imagery of something fresh and green, and nothing very important going on. "Tiameds" means something very pretty and dainty, like an ornament or a gift of some kind.

T. Not at all like the preceding one; its all very light and carefree, although some one seems to be talking quite seriously about it at times; the sounds rather too heavy for the meaning implied; I get plenty of imagery of things pastoral and romantic, like shepherds and flocks, and love making and that sort of things; "flos the clury porn" means that some one has found something very enjoyable and likeable.

W. Seems to be quicker than the other; no imagery, but a general feeling of haste; a good deal of motion to it.

Z. Very curious and light-hearted sort of a thing; visual imagery of a very fine, clear summer day and everything just right; attempts to be serious at times, but doesn't mean it at all; plenty of color to it, and a great deal of animation; seems to be all in the first person; some one is describing an adventure in a somewhat humorous manner; there may be laughter in it.

Y. Seems to be a description of some incident of pretended importance; very romantic and quaint sort of a thing; some of sounds are rich and musical, and again they become a little too hard to say to keep the impression with which the passage started; seems to go much slower than the sense of it demands; visual imagery of something like a tournament in the middle ages, where everybody is gaily dressed and happy; but the sounds seem to change the mood in places where the appearance of the words indicates no change at all.

The question might well be asked at this point,—upon just what were the subjects introspecting in connection with these transmogrifications? That the passages are fairly faithful to the originals can easily be discovered by checking up the sounds of both the versifications, but whether the subjects were introspecting on Keats and on Coleridge, is another very important question. But it is doubtful whether this can be decided.

The mean of the tappings for each subject indicates that none of them had as free a finger movement in these experiments as they had in those which immediately preceded, which, again, were lower than in the "Nerol" type of experiment. Evidently the

reading consciousness and the introspective consciousness drained some of the motor channels of their usual supply of energy.

Experiment:	Coleridge (Klj)			Keats (Stk)		
Subject	M.	M.V.	Rnj.	M.	M.V.	Rnj.
A.	60.2	1.9	11	63.9	1.4	11
B.	63.8	1.6	16	64.0	1.9	24
C.	70.3	3.6	18	71.0	4.5	15
F.	67.4	4.1	23	69.7	4.0	23
L.	64.5	4.1	13	64.9	3.1	14
N.	69.7	4.6	24	74.0	4.2	21
T.	72.1	4.8	21	76.3	3.7	17
W.	64.2	2.9	20	61.0	2.6	20
Z.	41.9	1.1	13	43.6	1.5	9
Y.	36.8	1.3	9	40.0	.9	8

The rank list of the above:

Experiment:	Klj. Stk.		Klj. Stk.		Klj. Stk.	
Subject	Mean		M.V.		Rnj.	
A.	c	d	d	b	b	c
B.	d	e	c	d	e	j
C.	i	h	g	i	f	d
F.	g	g	h	h	i	i
L.	f	f	e	f	d	e
N.	j	i	i	i	j	h
T.	h	j	j	g	h	f
W.	e	c	f	e	g	g
Z.	b	b	a	c	c	b
Y.	a	a	b	a	a	a

The relative positions are fairly well kept in these lists, and indeed better than one might expect in connection with such new material as the above experiments contained. It will be noticed, also, that all of the subjects but one, W., contributed to the increased motor output in connection with the Keats experiment over that of the one on Coleridge. A comparison of the tonal elements contained in these two experiments reveals the following differences:

	Coleridge	Keats
Accented		
Long vowels	44	34
Short vowels	21	31
Unaccented		
Long vowels	16	49
Short vowels	49	56
Accented		
Consonants	144	152
Unaccented		
Consonants	88	74
Total elements	362	356

From this it would seem that a preponderance of accented and unaccented short vowels together with fewer long vowels of both kinds, more accented consonants and fewer unaccented consonants were capable of being interpreted as giving the greater effect on the motor consciousness. These experiments were not given on the same days; and yet it may be that the week that elapsed between them for each subject was in itself sufficient to make the Keats Experiment easier and more capable of calling for motor output than the other. Yet none of the subjects found the second of the presentations easy; each syllable had to be gone over carefully,—certainly none of them read it at sight. Of the two experiments, the one on Coleridge "took hold" the better, and aroused and perpetuated its mood the more easily.

A more careful examination of these experiments reveals the fact that there are an equal number of accented "h" and "s" sounds; that Coleridge employs more accented "f," "m," "n," "r," and "w" sounds; and that Keats employs more accented "b," "d," "k," "l," "p," "st," "t," "v," and "z" sounds than does Coleridge. The inference is rather clear, that the explosive consonants and the short vowels are what makes the tappings longer in the one case than in the other. One has only to refer to the "Nerol" type of experiments for the same sort of indications; there, likewise, the short vowels were correlated with the greater amounts of motor discharge. Again, too, the "l" sound is allied with the explosive consonants and not with the liquids, but this may be only a fortuitous matter.

From the graphs of these experiments, it appeared that they were quite different both in height and in slant; the Coleridge graph was the steadier of the two and even tended to sink slightly at the end, while the other one rose at one angle of inclination until the eighth decasyllabic line, and at another angle from then on until the end. The short vowels and explosive consonants seem to be both more energetic and more irregular in their effects upon the tapping. Also the greater motor output appeared to take less time.

There follow the eighteen regular XIII and XIV experiments together with the introspection given upon them, after which is given the numerical results and the various correlations.

KEATS, EXPERIMENT XIII

I stood upon a shore, a pleasant shore,
 Of fragrance, quietness, and trees, and flowers;
 Too full of joy and soft delicious warmth.
 I sat me down, and took a mouthed shell
 And murmured into it, and while I sang,
 And with poor skill let pass into the breeze
 The dull shell's echo, from a bow'ry strand
 Just opposite, an island of the sea,
 There came enchantment with the shifting wind
 That did both drown and keep alive my ears.

KEATS, EXPERIMENT XIV

Tōō nōrj ōv zīl tī stōrānt qūide ā mūr
 And shōōl ā prēēz ōv mōrp ānd thōnāns lā
 Pū shoi thū flowd ūp wēērz ī shīltīng zōōr
 A thoum ēd frōl gēr lōft ānd tāss ēt drēē
 And kāfe ūs shēnd ā jown dē zāng mēnt ōl
 And shīth ōōr wīs ānd strāmērd wīt rī mānt
 Shī nowd ānd wīth ēn tāss ī pōdlānd kūv
 And skēē thāt whī zō kūl tō dōw thū frīm
 Thār vī stō zīt īn sōō thū strēbēl nīd
 Thō chēē nām kēb ī tīd thū pīfe mē sēn.

Keats XIV. (The transmogrification of Keats XIII.)

Subject A. P. Cast a visual image of a woodland scene, a stream in it, and then a great number of woodland and water noises until it got very tiresome indeed; seemed to repeat the same thing.

B. P. Seemed to be hard to say and there came imagery of a summer scene, and men in it, probably engaged in some contest or other; it is a narrative, anyway; the "l" sound was very conscious, and the accents were hard to get right; yet the more he read it, the smoother it became; to look at the page, it seems to be full of "s" and "z" sounds, but not while saying it.

C. P. Seems to be a description of natural scenery, woods, trees, flowers, grass, sea water and some one seems to be talking freely about it; but the talk is not as good as what it describes. Kinaesthesia seems rather forward.

D. P. I can't imagine it being any thing else but an out of doors scene that some one is describing or enjoying; there's water there, and everything is peaceful and quite pleasant; it is emotional and the feeling is contagious.

K. P. No exact meaning, or imagery that was dependable came; but it is

a description, and is just a little declamatory, with a note of melancholy, and perhaps, resignation in it; also a certain amount of will and determination.

F. N. Very conscious of the difficulty in saying it, and each syllable felt as if it were a mouthful; no imagery came, only the feeling of laboring at the pronunciation continued throughout. "Podland Kuv" ought to have meant something; could not get away from the strain of reading it.

L. P. This seems more intellectual than lyrical, or at least is not fully, freely lyric; such words as "shilting," "thonance," "storant," etc., are very pleasant; the sounds ran together very well. The tonal quality was epical.

M. P. It looks worse than it sounds; images a woodland scene, and thinks of the "Midsummer's Night's Dream"; there is water in this scene, and something weird and peculiar is happening. Would like to read it often and become familiar with it.

S. P. It is describing a natural scene, with trees and flowers and water in it; sense of relaxation in it, the more it is read.

BYRON, EXPERIMENT XIII

And dreams in their development have breath
And tears and tortures and the touch of joy;
They leave a weight upon our waking thoughts,
They take a weight from off our waking thoughts,
They do divide our being; they become
A portion of ourselves as of our time,
And look like heralds of eternity;
They pass like spirits of the past,—they speak
Like sybils of the future; they have power—
The tyranny of pleasure and of pain.

BYRON, EXPERIMENT XIV

Thũ mēēz ă brēnt ĩn zāre ĩng mēth dē rēēt
And chēv thũ năd ănd thēēlĭng pōrtŭrz vīde
Thũ droi nă jā thā plāke ĩts spērăld hēre
And kōōl dăv tŭlz dĭ vŏn shŭn pēlz ĩn toi
In tăpe thũ wāke ōp tōse our kĭme ĩts wā
Mōrf stăwt ĩ bĭs thā tŭv ăz nă lĭke wē
Kĭ thā tŭr fēz ōv năd row fŏm bē rēēt
How kăde ăs pŏv rā wēēt lă kăssŭng fŏv
Văl tŭr thŭp sēēb ōv pŭr thā towp ŭr thŏō
Ră vĭth ōōr vŏl tă kĭ thŭs ōv thũ rēē.

Byron XIV. (From transmogrification of Byron XIII.)

A. N. It describes action or scenery; the meaning is vague and elusive; doesn't seem to run smoothly and evenly, and gives him a feeling of tension.

B. P. Gives a feeling of something portentous, but very enjoyable, even if it is fearful; is quite determined and full of energy, and might be said very loud; it seems to be held back all the while.

C. P. Quite tiresome, as compared with the former (Keats); but it means something, perhaps, like a struggle or some activity somewhere.

D. P. Harder to say than the one previous (Keats); liked lines 4, 5 and 9 very much; thought of something rather deadly and threatening; the meaning did not come clearly.

F. P. Goes easier than the former (Keats). Seems to be more creative than the former; is speaking of familiar things in a heavy manner; sounds oratorical, and can be spoken tragically.

K. P. Not quite so pleasant as the former; little declamatory at first, later on is subdued and a little tense.

L. U. Seems like a reporter's account of some event; has no poetic beauty; it is too hard.

M. U. Seemed hard to say; the sounds themselves reminded her of a slave driver, urging somebody on; dreadfully conscious of the effort to pronounce it well, and the emotion aroused was one almost of suffering.

P. P. It was all hard work to say, and about the middle he felt as if some dreadful force was pulling him back.

S. P. The last was static (Keats); this is dynamic; this does not describe still nature, but moving nature; there is no relaxation here as there was in the last one. Not so poetically intense, but more physically intense.

ARNOLD, EXPERIMENT XIII

And Rustum gazed in Sohrab's face and took
The spear, and drew it from his side, and eased
His wound's imperious anguish; but the blood
Came welling from the open gash, and life
Flowed with the stream;—all down his cold, white side
The crimson torrent ran; his head drooped low,
Till now all strength was ebb'd, and from his limbs
Unwillingly the spirit fled away,
Regretting the warm mansion which it left,
And youth and bloom, and this delightful world.

ARNOLD, EXPERIMENT XIV

Thũ gōrt zōn krāde hĩz lānnĩng wēllūs fīde
And tōōz āb sāke ĩt spēēn ā wāy nād zēē
Hĩz drōōmĩng strēē zĩt nowd thũ mĩth ĩl grēm

Rē tīs ĩn wīle ũm stūr nād pēēr ĩsh fröll
 Hīz yōōm ānd rōōth ũn woun thū dāz ĩt līng
 Kā sō shūn blī pēn dōle ānd nowb ũn thēē
 Fūl thēng dē thēl wār spēē thū shēmīng lōr
 Wās frōl dō gām ānd chī flānd whīt zā rūd
 Āll sūr tī wīb ānd wēft hīz tī nīd mō
 And blān ěnt strēb thū frīmz drōōm āll thū mūrld.

Arnold XIV. (The transmogrification of XIII.)

A. P. Very highly interesting, like the preparation for war or like some very tense and exciting situation; auditory and visual imagery of this,—also the sea entered into the imagery at times; the emotional tone, which was intense, had to do with death or things associated with death; feels "erhabend."

B. P. Attention chiefly occupied with the pronunciation and the kinaesthesia, which was sibilant rather than dental; the passage does not seem very poetical or rhythmical; seems like narrating the virtues of some ordinary poetry. (N.B.—Subject B. likes very erotic and sensational poetry, notably Byron and Keats.)

C. N. Contains a lofty concept, and is probably epical; not very decisive or tumultuous,—at least it does not manifest emotions freely; thought the sounds were produced in the rear part of the mouth; was rather hard to say.

D. P. Sounded dramatic and oratorical; a trifle tragic, but not wildly so; nevertheless it is not resigned; quite hard to say, and seemed to be full of thin, high sounds.

F. P. Slightly laborious here and there; some lines, notably Nos. 5 and 9 went slowly; had no imagery.

K. P. Slightly rhetorical, but restrained in its emotion; felt his own breath and pulse quicken at times; there is tonal and emotional warmth about it,—more so than with any previous experiment. It is not easy to read.

L. P. It might be Tennyson in Swedish or Dutch; was so taken up with the pronunciation that nothing in the way of mood or emotion came.

M. U. It dragged horribly and was hard to say; felt as if the tongue were too large for the mouth; the first five lines began to mean something, but it all tumbled suddenly into nothing again.

P. P. Felt dreadful tensions in the finger, which seemed to be pulling an enormous weight; could not get this out of consciousness, and so no meaning or emotions came.

S. P. Describes some fight or conflict; the feeling is not so intense as it might be; it seems more internal, more like giving oneself needless anxieties.

TENNYSON, EXPERIMENT XIII

There often as he watched, or seemed to watch,
 So still the golden lizard on him paused,
 A phantom made of many phantoms moved

Before him haunting him, or he himself
 Moved haunting people, things and places, known
 Beyond the line; the mill, the leafy lanes,
 The peacock yewtree and the lonely Hall,
 The horse he drove, the boat he sold, the chill
 November dawns and dewy-gloomings down,
 The gentle shower, the smell of dying leaves. . . .

TENNYSON, EXPERIMENT XIV

Thũ stōl dēn zēl īng gāde ānd mōzārd wēēn
 Thũ lēn tōn chāzly fānnōck paunt ōr thīll
 Bē mīngz hīm chōffēn māwzd ōr sōōvd thũ lōr
 Nō shēn thũ rawnz tō chēēl thũ glōney fānd
 And nī thũ sōōmīng vownz ānd bāwntīng nēlf
 Rā wōne thũ nēēvz ā smōld hīm lōōbry hāwn
 Thũ fāltōn plāss ōr hēmpel mē thũ sōve
 Thũ dīl hīm sōnd ōv hōte thũ lōōtrēē dēēm
 Bē fōrthīng glīd hē towd thũ pādri yīll
 Sō dēēl ōv yāme ānd sōlgērn hē thũ vōre. . . .

Tennyson XIV. (The transmogrification of XIII.)

A. N. Peculiarly baffling sort of a description,—now of nature, now of a person; very much like a sad reminiscence and full of a sombre, wild melancholy; had visual imagery of rank nature.

B. U. Seems like extolling or eulogizing some person for patience and benevolence; did not seem very poetical; the kinaesthesia was chiefly dental.

C. P. Interesting description of something; puts him in a mood similar to that of Gray's *Elegy*; there is some human interest involved and something is at stake. Very good poetry, and it runs along very smoothly; the kinaesthesia seemed to be more forward than usual.

D. P. Gives a feeling of sadness; dreamy pessimism of a quiet character involved; it does not describe activity, but has to do with some outdoor, natural scene. Prefers lines 6 and 8.

F. P. Full of emotion; visualizes a rich natural scene, full of shade and trees and water; somewhat pastoral in aspect, but not in the feelings one has about it; the sounds flow together nicely, and at times seems a little like a speech.

K. P. It is melancholy and resigned, and is not dynamic; tells a sad story and induces tensions and feelings of restraint at times.

L. P. Full of moral enthusiasm, devotion and the like; may be the description of some medieval character, knight, or noble person; very lovely and poetic.

M. P. Thinks of Chaucer's poetry; interesting and romantic description of a maiden about to have some adventures; the words "fannock," "paunt," and "nelf" very rememberable.

P. P. Gives a rather hypnotic and dazed feeling; the tapping seems enormously labored; likes line 5 the best of all.

S. P. Reminds him of Sohrab and Rustum; got no imagery but had a tense feeling all the way through; may be describing some natural scene.

SHELLEY, EXPERIMENT XIII

Where plants entwine beneath the hollow rocks
Beside a sparkling rivulet he stretcht
His languid limbs; a vision on his sleep
There came, a dream of hopes that never yet
Had flushed his cheek; he dreamed a veiled maid
Sate near him, talking low in solemn tones;
Her voice was like his own, its music long
Like woven sounds of streams and breezes held
His inmost sense suspended in its web
Of many colored woof and shifting hues.

SHELLEY, EXPERIMENT XIV

Thũ plēeth ěn tĩne hĩz röllĩng kössēd spār
Bē stānd whāre hĩvlĩng nĩde ā lēt ěn slēēm
Thāt sköllĩng strōnz ōv lānyũn būf zũ wōō
And chēv hĩz lois hō rēsk ānd pōn ā strēē
In tĩzh bē lĩne ĩts drāme hē mĩz yōō rēēn
Hĩz shēft sām tewz thār yēng sǎ vā wĩd flēēk
Lĩ mōng hēr tũsh ā chēēmd ĩts kēētĩk hō
Hĩz brēemy vowndz hē dāwk ōv lēnmōst wĩn
Hǎd zēld ōv wōpēn shĩmz hĩm stēnsēd hewm
Wōs vōlērd spō kē vĩk sēt drālērz wĩn.

Shelley XIV. (The transmogrification of XIII.)

A. P. Has a feeling that the thing described is a rather unfortunate affair, and deserves sympathy; later comes the idea that somebody is speaking largely of himself, maybe even in braggadocio.

B. P. Visual imagery of the sea shore and people on it; a good deal of the "n-drone" in the poem, and this calls up the roar of the sea; the first four lines are easier to say than the last six.

C. P. Vapory sort of a thing; seems animistic at times; got the idea of

the sun shining and the word "hiz" brought up rather egoistic notions. Kinaesthesia frequently back in the mouth.

D. P. Thinks of a slippery and slidy waterfall; several times it gave a creepy, and crawly feeling; visualized the "Nude descending the Stairs."

F. P. Flows very well; gives an outdoors, cool effect.

K. P. Slightly rhetorical, but not heavy or sombre; very clear and light sounds, and it runs off just as easily as real words do.

L. U. Cannot seem to make it blend; it doesn't fit into any organic rhythm; the fourth line alone good.

M. P. It is first a narrative, and then something very mysterious and like a fairy tale; like the story of some very wonderful thing, told with wide open eyes. Strange that it should sound so foreign and also so familiar.

P. P. The first half is very good, the last not; organic strains come in at the end, and make it pull very hard. "Lanion" is a very good word.

S. P. Describes an adventurous scene; concerned with human life very intimately; gets social concepts about it and maybe an idea of some work or activity.

MILTON, EXPERIMENT XIII

Before the gates impaled with fire there sat
On either side a formidable shape.
The one seemed woman to the waist, and fair,
But ended foul; about her middle round
A cry of Hell-hounds never-ceasing barked
And rung a hideous peal. The other shape,
If shape it might be called that shadow seemed,
For each seemed either—black it stood as night,
And shook a dreadful dart; what seemed its head
The likeness of a kingly crown had on.

MILTON, EXPERIMENT XIV

Thũ mōr ble gīre bē tāse ōn lāpe thũ dēēth
Im stā thār fīde ā shālīng fōrdūl wēēs
It bowm hēr sōō mī wēndly kārē ān tow
Būt kīle ēd mārē ānd krēlyūs wōn ēr stā
Thũ lound hīs nīngfūl pēēm wīth shālldēr sēv
It shā zound blēēth ēr fūng rō pīle ā chēē
Thũ dōōpnēss hī būt stā dā nōck dās hīd
Whāt dēēs thũ mēd ōv shēmd ā crūv hād rīsh
Sēē tōōd mā dās ā thōd mō kowm īf hī
Nē drōd bā tārē āz fūd rē kōōp thāt rēē.

Milton XIV. (The transmogrification of XIII.)

A. U. Gives a feeling of sombreness, and arouses ideas of death and fatalism; makes him very depressed and he asked himself the question, "what boots it"; consciousness directed toward the sensory side, and felt much strain and tension.

B. P. Gives an idea of some activity, like the chase, or even trouble of some sort; smooth and rhythmic all through; head resonance very pronounced, and the whole mouth cavity seemed to be active.

C. P. Seems to be an exact description of some rough scene, maybe of a rough and rocky country; some event is taking place at the present time, perhaps in the "historical" present. Kinaesthesia not noticed especially; prefers lines 3, 4, and 5.

D. P. It is not emotional and not romantic; seems to be telling about some difficult situation; sounds are hard and rocky, and yet it all blends smoothly together; "d" and "m" very prominent, and "med," "des," etc., particularly noticed.

F. P. Sounds like a bass drum; it pounds along and gives a feeling of strain and force and sometimes harshness, but as a whole it knits together well; the numerous "d" sounds are provocative of strain sensations, and the pleasure comes from doing a difficult task well, or nearly so.

[K. P. No very definite meaning to it at all, but in general it is weird and now and then cumbersome; easy to say, rhythmic.

L. P. Not a lyric, but a very serious and heavy narrative; describes something like a tournament, and the shock of arms; could not keep the excitement out of his voice.

M. U. Got very annoyed at it the more she said it; does not think it is at all lyric or gentle; too many "d" sounds, which made it drag and scrape along; for a while it sounded like some of Chaucer, but then she decided it was quite modern; even belligerent at times.

P. P. Line 5 has a meaning, but he did not get it; it ought to mean a lot; the last four lines pulled like everything and strain sensations were felt all over the body.

S. P. It is a narrative of some strong and determined activity all through; seems to be told in the first person; cannot think it is lyric, or gentle at all; did not let himself get into it very far, as he does not like that sort of poetry.

WORDSWORTH, EXPERIMENT XIII

Abundant recompense; for I have learned
To look on nature, not as in the hour
Of thoughtless youth; but hearing oftentimes
The still, sad music of humanity,
Nor harsh, nor grating, though of ample power
To chasten and subdue. And I have felt
A presence that disturbs me with the joy

Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns. . . .

WORDSWORTH, EXPERIMENT XIV

Tōō lēns ōv mūrđ ă būnyōōr noi dānt zī
Nōr stēllōm krēē mēns nāte īng vār nād mērbz
Lī pōn ă zēt fōr chāddēn prēllīng nowr
Hāv sōōltēr grēnnēd yōte īng hīv thū kīme
Az thawn ōn lōōth ād hōvlēss mī thū dāse
Dīs tām būt fewt ōr thāte īng mēwple nīd
Tōō hīftēn thōdrīng jāse īk wēs nī lowr
Hew thī sōv pāf hōōz lawts ō rīth ē tewd
Sūb tēl thū sīsh ă zāt ōv wēs ē thūn
Sūb tīze thū spēē vōm tōs hāv nīz ōv nār. . . .

Wordsworth XIV. (The transmogrification of XIII.)

A. U. Seems to be a vague, meaningless jumble; suspects that it is philosophical; certainly it is not the description of any activity, and does not have anything to do with the common acts of life; not heroic nor epical.

B. P. Fairly smooth and rhythmic; mellow; meant something warm and pleasant; visual imagery of summer scenes, rivers, and green shade and kindred things; idle, rather than active, and musing rather than otherwise; in spite of the apparent number of "th" and "s" sounds, it was kinaesthetically pleasant.

C. P. It is descriptive of nature, and has no climax; runs along easily and smoothly; and the kinaesthesia is quite forward.

D. U. Gave a cold and clammy feeling; even snaky at times; it not active and does not contain anything erotic; imagery of nature, but not in summer; "kremense" gave the idea "cream" = "food."

F. N. Seems to go very freely and easily; many French sounding words in it; no imagery.

K. P. Gets a feeling of resignation, and slight melancholy; noticed the breathing and pulse were quickened toward the end; sounds were not noticed at all.

L. P. Narrative poetry; slightly elevated and epical.

M. P. Quiet and subdued in some places; but often the look of the words disturbs the mood; no imagery.

P. P. Meant nothing as a whole, though several of the words began to mean their phonetic equivalent; goes well and recites easily; gives the feeling that he is hearing some one recite something well learned.

S. P. It is like a description of Nature, perhaps, of the sea, the woods, or hills,—something grand and lofty; there is a tinge of regret in the last three lines, and it seems to be mystically said; went easily and rhythmically.

COLERIDGE, EXPERIMENT XIII

'Tis the merry nightingale
Beside a brook in mossy forest dell,
That crowds, and hurries, and precipitates
With fast thick warble his delicious notes,
With skirmish and capricious passagings,
And murmurs musical and swift jug jug,
And one low piping sound more sweet than all,
As he were fearful that an April night
Would be too short for him to utter forth.
His love-chant, and disburthen his full soul
Of music!

COLERIDGE, EXPERIMENT XIV

Thũ rāle ĩn tĩz mĩ brēm dũs nĩ zĩk mũr
With tũll ěst crown ăn tōō mērz gēd rĩ kōs
Jā dīle ĩng mew năd pō gũ sōōf ĩk năl
Dĩ fũrdz hĩm swēēfũl nădrĩz wōrthăn mewb
With răstfũl hĩz thăt tĩngz ăz rēēble skērth
Dē jownd ũs lĩst wōōd stō tēr shăndĩk spēē
Wēr hĩle tĩsh fēēchănt lōrsěj mĩn ănd swō
Bē sīg ōv tĩ mōr bēr năd few kă păsh
Fōr sĩl thĩs tăv pēr sâte lăth hĩz nōō shăth
Prē mērt zō tā tōō hĩft ěn prĩnd hĩs wũn.

Coleridge XIV. (The transmogrification of XIII.)

A. U. Got a conglomeration of feelings and ideas,—the whole mental state was disordered; felt that it meant something, but could only think of something to be prevented; never came to clear consciousness.

B. U. First impression was that the sounds were mostly dental; does not seem smooth and even, but jerky and overdone; it is telling something in a poor way, or else something that is not very important. "Rastful hiz" brings up the idea of conflict. Some of the accents bother very much.

C. P. Explanation and reëxplanation all the way through; trying to change an opinion and get a change of attitude; yet it is quiet and intimate and neither profound nor very active; seems to be an appeal to the intellect rather than to the emotions.

D. P. Doesn't seem very peaceful or placid; there seems to be an extraordinary number of the "s," "z" and "t" sounds in it; the thing was so hard to say, that no attention could be given to the meaning.

F. P. Pleasant rhythm, but the content seems dry and wooden; the sounds flow together fairly well, but it has no color.

K. P. For the most part the sounds are rather cool and clear; at times a trace of melancholy enters in; the sounds are well arranged and the rhythm is uninterrupted.

L. U. "Horrid!" No melody to it; the sounds do not blend together, and no reaction comes at all.

M. P. At first it sounded "worked over" and not spontaneous, but afterwards it got to be a quiet little narrative, or a quiet talk; tries to be a little solemn at times, but soon lightens up and gets almost "pert."

P. N. Means absolutely nothing; some of the words tend to get respelled and mean something in English, German and French, but the organic strains accompanying the process take the focus of consciousness; "rastful hiz" ought to mean something.

S. N. Nothing suggested or aroused by it; got no imagery, nor was any sound prominent; it was just a thing to say, and he was glad to get through.

BROWNING, EXPERIMENT XIII

Is this apparent, when thou turnst to muse
Upon the scheme of earth and man in chief,
That admiration grows as knowledge grows?
If, in the morning of philosophy,
Ere aught had been recorded, nay perceived,
Thou, with the light now in thee, couldst have looked
On all earth's tenantry, from worm to bird,
Ere man, her last, appeared upon the stage—
Thou wouldst have seen them perfect, and deduced
The perfectness of others yet unseen.

BROWNING, EXPERIMENT XIV

Thě nûrnst ă pār ũn skēē thăt wŏn ěd rā
Shŭ lŏn ănt fĕrd ěrz whĕm tŏō chŏrm thŏ mĕēf
Jĕ zŭme ěnt thŭr hăd lĭn rā wŏze ĭn grĭs
Now yăm pĕr thŭl ĭf drĕēp ĭz lă fĕct rĭn
Rĕ mŏrd ow stā thĕm jŭd rā sĕēl ũp năd
Hĕr stăz ĭng lŏ fĕct mĕē frŏm nĕss ĭn stŏŏn
Dĕ grā mĭ tĭth ănd pĕr thĕē vĭ nĭf kawm
Thŭr wăn thăp vĭd now kĕn thŏn dĕēs thĕ năd
Tŭ dŏth hĕr nŏs ōf bew pĕz tĕk ōf nŏŏr
Thŭ dŭrs thĕ tĕp hăv tŏn thou stĭb ũp tŏs.

Browning XIV. (The transmogrification of XIII.)

A. U. Sounds somewhat descriptive, and somewhat philosophical; slightly remorseful feeling at times.

B. U. Not good poetry at all; too stilted and commonplace; may describe some strife or disconcerted state of mind; very hard to read, to say, and to tap; the first tonal impression was: "ssst." Yet the rhythm seems very good, even if the sounds are not smooth and mellow.

C. P. Some parts are smooth and others are rough; seems like one sound after another and nothing more; the kinaesthesia is very far forward.

D. U. The sounds jump around very irrationally; much impressed with the tonal inconsistency. No meaning could be possible in this passage.

F. U. Hard to say; wants to go on, but cannot; sounds like jumping from one stone to another across a brook; it doesn't flow at all; to say some of the sounds, *e.g.* "durz" gives him an awful pain in the nose.

K. U. Rhetorical and slightly melancholy; interesting because such a dreadful jumble of sounds; couldn't say it fast; feels as if he had bombarded his face with words.

L. U. It is some soliloquy, giving the pros and cons; doesn't excite, and is not important or profound.

M. U. It is not poetry; the pleasant sounds are in the minority; took all the attention to say it, and means nothing; seems like one hundred separate syllables.

P. P. Has no meaning, but goes rather easily; "her stazing," etc., ought to have some meaning, but it doesn't.

S. P. Seems calm and quiet, and draws some analogy between nature and human life; has just a touch of sadness in it; it is animistic, and psychologizes; at the end it seems not sad, but calm.

MARLOWE, EXPERIMENT XIII

I will, with engines never exercised,
Conquer, sack, and utterly consume
Your cities and your golden palaces;
And with the flames that beat against the clouds,
Incense the heavens, and make the stars to melt,
As if they were the tears of Mahomet,
For hot consumption of his country's pride;
And till by vision or by speech I hear
Immortal Jove say, "Cease, my Tamburlane,"
I will persist, a terror to the world.

MARLOWE, EXPERIMENT XIV

Ī sĭll thŭ nĕv yōōr kōng ĕn zōōm thŭ wĕn
And flāzēr tĕx thăt gŭld ĭn kloum ĭ zĕlt

Im dīle shŭn kō fōr mēnst ăn gēēb hīz lāne
 Thŭ tāmriž wēr wīth prēnt ā stēmbēr sānz
 Thā chēē tāl spōr ūn rādz yōōr sīnd hāz lāke
 Tōō sēm thŭ pārž ănd hō jīnz wāv ēr zēēr
 A stīth ōv tōs bī vīzh ā wīmp tēr zērlđ
 Bŭr kīde īz tīf kēr mōr năd sōō nă lēns
 Thŭ hīv ērk tōv sā jīt pēr wēēt rē tēsk
 Dō rūt mī hēēs ōb tā kōn tŭs lī tām.

Marlowe XIV. (The transmogrification of XIII.)

A. P. Thinks of something in connection with government or rulers, monarchies, or the like; very egoistical, and is a conversation describing something in utter pride; hard to say until this meaning became focal.

B. P. Predominantly dental; the rhythm is very good; no meaning except one of vigorous activity; thinks of something high and bleak, like a precipice and people near it; not liquid or labial enough to be the best kind of poetry.

C. P. Describes something, possibly; arouses some attitude of eagerness and slight forcefulness, and the kinaesthesia was very far forward in the mouth as if it was an oration.

D. U. It is rough, jerky, noisy and shallow, and gets worse at the end; seems very high pitch, and the "s" is too prominent; it is vigor without depth.

F. P. Has no harsh sounds, and flows well,—also better at the start than at the end; images some one reciting very loud, standing up, and railing at the social order of things.

K. U. The sounds get worse and worse and the whole thing is one emphatic drive from beginning to end; seemed ludicrous on this account.

L. U. Description of something, or else philosophizing, but has no emotional depth; more or less interesting as a collection of sounds, but there is not much to be gotten out of it.

M. U. It is hard work, not poetry; gets the idea that someone is digging away with a dull shovel, ten pounds of work to one ounce of earth; can manage the first five lines fairly well, but the rest has neither rhythm, nor beauty.

P. P. It means nothing, but the saying of it is a dreadful strain; tried to let some of it go freely and then he got all mixed up; and even when he tried to control it, it began to pull his arm like a ton of lead; had to go slow and rest while he said it.

S. P. Some passionate and disturbing person is "bluffing" in this poem; there is depicted passion, scorn and defiance.

Rank lists for the experiments numbered XIII and XIV, performed during the second year's work.

I. THE POEMS IN ENGLISH (XIII)

I. Mean. Subject	Keats	Byron	Arnold	Tennyson	Shelley	Milton	Wordsworth	Coleridge	Browning	Marlowe
A.	d	d	c	d	d	c	c	d	d	c
B.	c	c	d	c	b	d	d	c	b	b
C.	f	f	g	g	h	g	f	h	g	g
D.	e	e	e	f	f	e	e	e	f	e
F.	g	g	f	e	g	f	g	f	h	f
K.	a	(throughout)								
L.	b	b	b	b	c	b	b	b	c	d
M.	h	h	h	h	e	h	h	g	e	h
P.	j	(throughout)								
S.	i	(throughout)								
II. M.V.										
A.	e	i	f	g	g	h	e	f	i	d
B.	f	d	e	f	f	f	f	e	d	e
C.	d	e	d	d	e	g	d	d	e	f
D.	g	g	g	h	d	c	g	g	f	g
F.	c	c	b	c	c	e	c	b	c	c
K.	j	(throughout)								
L.	h	h	h	e	h	d	h	h	h	h
M.	i	f	i	i	i	i	i	i	g	i
P.	a	a	a	a	a	b	a	a	a	b
S.	b	b	c	b	b	a	b	c	b	a
III. Rnj.										
A.	g	h	f	h	i	i	h	i	h	g
B.	e	e	e	f	f	g	f	d	f	e
C.	d	c	c	c	d	d	d	e	e	d
D.	c	d	d	d	b	c	c	a	c	c
F.	h	i	j	j	e	e	e	f	g	f
K.	j	g	i	g	g	h	g	h	j	i
L.	i	j	h	i	j	j	j	j	i	j
M.	f	f	g	e	h	f	j	g	d	h
P.	a	a	a	a	a	a	b	b	a	a
S.	b	b	b	b	c	b	a	c	a	b

II. THE TRANSMOGRIFICATIONS

I. Mean. Subject	Keats	Byron	Arnold	Tennyson	Shelley	Milton	Wordsworth	Coleridge	Browning	Marlowe
A.	c	c	c	c	c	e	d	c	c	c
B.	d	d	d	d	e	d	c	d	d	d
C.	h	h	h	h	d	h	g	h	h	h
D.	e	e	e	f	f	e	e	f	e	e
F.	g	g	f	e	g	g	f	g	g	g
K.	a	(throughout)								
L.	b	(throughout)								
M.	f	f	g	g	h	f	h	e	f	f
P.	j	(throughout)								
S.	i	(throughout)								

II. M.V.

A.	g	g	f	f	h	h	g	g	h	h
B.	d	f	d	d	g	c	d	f	g	g
C.	f	d	e	h	e	f	f	e	f	f
D.	i	i	i	g	c	g	h	i	e	e
F.	c	c	c	c	d	d	b	c	c	c
K.	j	(throughout)								
L.	e	e	g	e	f	e	e	d	d	d
M.	h	h	h	i	i	i	i	h	i	i
P.	a	(throughout)								
S.	b	b	b	b	b	b	c	b	b	b

III. Rnj.

A.	f	i	i	j	h	b	i	j	i	g
B.	e	g	d	i	i	g	j	i	j	a
C.	b	f	f	h	j	e	d	c	g	i
D.	d	e	j	c	g	j	a	h	e	b
F.	h	b	g	c	b	c	b	f	a	f
K.	c	d	e	d	b	i	h	d	c	h
L.	j	h	c	e	a	d	g	g	h	d
M.	g	j	a	g	f	f	c	e	b	j
P.	a	a	b	b	d	a	e	a	d	e
S.	i	c	h	a	e	h	f	b	f	c

CORRELATIONS IN POINT OF VOWEL AND CONSONANT QUALITY,
QUANTITY AND PERIODICITY

The rank lists for these experiments are the best we have yet obtained, for even those for the mean variation and the range show much steadiness of position for the various subjects. The correlation between feeling tone and motor discharge, however is of the same general type as we have obtained before; the unpleasant and the neutral experiments produce the longest tapped strokes, and usually, also, the Transmogrifications produce longer tappings than do the sources from which they were derived. This was also shown by the graphs for these experiments which may be considered somewhat in detail. They show exactly the same effects as the two first transmogrifications did,—that the explosive consonants and the short vowels produce a greater motor effect than do the liquids and the long vowels; take, for example the first four of these experiments performed, the Keats XIII and XIV, and the Byron XIII and XIV. The Keats XIV graph was higher than the Keats XIII, and the Byron XIV higher than the Byron XIII; the XIV's are also both longer than the XIII's. Now take another point into consideration: there are in the Keats XIV 23 short accented vowels, and 40 short unac-

cented vowels; 38 explosive accented and 22 explosive unaccented consonants. In the Byron XIV there are but 13 short accented vowels, 29 short unaccented vowels, 40 explosive accented and 18 explosive unaccented consonants. The conclusions are apparent and from the following lists of short vowels and explosive consonants in these twenty ten-line experiments, one can see the same tendency in all but two or three cases.

		Acc.	Unacc.
Arnold:	Short Acc. Vowels, 26; Unacc., 40; Explosive Cons.,	37	27
Tennyson:	Short Acc. Vowels, 17; Unacc., 28; Explosive Cons.,	30	18

And the Arnold experiments aroused more motor discharge than did those of Tennyson. Compare also Shelley and Marlowe, XIII and XIV:

		Acc.	Unacc.
Marlowe:	Short Acc. Vowels, 28; Unacc., 26; Explosive Cons.,	32	16
Shelley:	Short Acc. Vowels, 22; Unacc., 38; Explosive Cons.,	36	16

The graphs for these experiments showed clearly again that the motor discharge is dependent upon these sounds, and just as these two poets are nearly equal in the number of them they employ, so are the graphs almost equal in height and other features.

Likewise with Wordsworth and Coleridge; the graphs are nearly equal in height and so are the determining sounds in number.

		Acc.	Unacc.
Wordsworth:	Short Acc. Vowels, 24; Unacc., 36; Explosive Cons.,	31	21
Coleridge:	Short Acc. Vowels, 24; Unacc., 35; Explosive Cons.,	34	24

Milton and Browning do not show the same sort of correlation in this respect as do the other poets; the graphs showed this very clearly; the unlyrical subject matter of the Browning XIII experiment and the general negative character of the effect of the transmogrification bring again into prominence the introspective side of the experiment.

Insofar as any validity can be attached to the results thus obtained, it appears that the accented syllables alone are not in all cases sufficient to account for the increase of motor output caused by one line or one passage of poetry over that of another. Construed in their psycho-motor effects, either syllable, the ac-

cented or the unaccented, can be the cause of heightened motor manifestation. To this effect, then, we ally the results of our previous investigation in regard to the length of the "long" vowels: in both cases it appears that the intentional prolongation of a letter or syllable in consciousness is one thing, and the reverberant effect of such prolongation is another. In such cases one can at least catch a curious glimpse of the functional nature of some phases of the introspective and motor consciousness in their overlapping parts in point of the qualitative distinctions to be made between quantitative similars which only an analysis from the twofold standpoint of psycho-motor manifestations would break up out of a subtle fusion.

Mention must be made again of the form-quality of the graphs for these first long experiments. Just as characteristic differences had occurred in the graphs for the single lines of each of the poets, so here the XIII experiment for any poet produced a graph which had individuality as contrasted with the XIII of any other poet. Likewise with the XIV experiments. Those passages, whether XIII or XIV which had gone easily and smoothly in the recitation also went smoothly in the motor consciousness and the dip of the graph line from first to fifth foot was more marked than in those poets which produced other than the above mentioned effects. In every case the motor display and the introspectional flow showed what at least by analogy might be called common parts. Not strange, of course, since by this time the motor pattern of consciousness on the voluntary movement side was now paralleled by the apperceiving tendencies of the reading and speaking consciousness.

In many cases by actual counting of the accented and unaccented vowels and consonants, it was not easy to see why some of the introspective and motor effects were produced. Frequently the very look of the page, before an attempt to read it had been made, would suddenly "set" the motor tendencies in a very definite way, while the results of this "setting" would conflict with the auditory side of consciousness at the termination of the experiment. And so we had the conflict of such things as the fusion of subliminal stimuli for the read-

ing consciousness with the fusion of liminal stimuli in the auditory consciousness, and the like; here, also, the position of letters in the line, and the periodic recurrence of a letter as seen, but neglected in the speaking consciousness, or of sounds possibly unpleasant *quâ* sounds, but affording no displeasure on the side of visual form, entered as rather incalculable disturbances throughout the whole run of these larger experiments. That they could have been made constants, rather than variables, however, lies well within reason, had the experiments been conducted as a slow, inexorable arithmetic of spoken sounds, rather than as an esthetico-psychological investigation. In this connection it is significant to remark that the subjects took an entirely different attitude toward large passages, from what they did toward single iambic syllables, repeated to the point of tedium.

This ended the experimental work for the second year. We had performed 336 single-line experiments and 20 ten-line experiments and the results have been all given in the preceding pages. On the whole, the results are clear; from the numerical results of the 128,000 tapped strokes made during this year's work we have obtained proof that the unpleasant and neutral states of mind are correlated with a greater motor output than are the pleasant states; from the introspection on the vowels and consonant experiments we have been able to make statements about the effective and affective values of the various classes of letter sounds; while from the transmogrifications of the large passages of poetry we have been able to conclude that the sounds of poetry, especially lyric poetry, are able of themselves to arouse a mood congruous to that mood which the normal recitation of the original poem would arouse. This is exactly in line with the notion, on the basis of which the original thesis was made: the sensational element in poetry that is derived from the sounds themselves is immense,—poetry is largely tonal,—and it is certain, conversely speaking, that those poets which neglect the finer sounds of the language either deliberately or otherwise deny themselves a hearing that is worthy of cultivation.

THE TRANSMOGRIFICATION OF OTHER THAN
BLANK VERSE INTO TEN-LINE PASSAGES

Only five subjects took part in the third year's work. With one exception, the experiments were all transmogrifications of other than passages of blank verse poetry. This exception was Shakespeare XIII. No suitable passage had been found during the first two years of the work, and this was the cause of the delay. The numbers attached to the third year's experiments mean as follows: XV means a passage of poetry, not blank verse, transmogrified,—usually a passage in decasyllabic lines; further experiments, numbered XVI, etc., means usually a passage of shorter than decasyllabic verse.

These poems were not very successful in the experiment. In the first place, rhyme is an encumbrance to the transmogrifier,—it makes alliteration almost a necessity, if one is to transmogrify line for line or keep the first lines of the poem in the first lines of his construction; in the second place, short-lined poetry does not have enough tonal body, usually, to be satisfactorily transmogrified into the heavier decasyllabic lines; there is something solid about iambic pentameter which must be maintained in order to keep the effect serious and dignified.

We next give the introspection of the third year's experimentation, and after that, a résumé of the numerical results and the correlations on the basis of feeling tone and motor discharge.

KEATS, EXPERIMENT XV

Second transmogrification of "I stood tiptoe upon a little hill."

Ī hõn tle tō thũ ĩl tĩp stēr bĩ vīt
Sõ lõõd ĩng prānd ũp kīde ěst. mōd ũ thĩl
Wĩth ũdz ĩn bōõl wũz drānt ĩng stěrv thũ slāre
A lĩs ĩng kīde ũ lāpe lĩ chĩst õv whēmz
And fānt ěr tōõp rĩ whēmz ěēt sōrn lĩ nēēvd
Pũl õst ā lāt thāre dĩn yět thõb thũ dār
Frõm fĩ lĩ kōv thē ěpt hād mawt thũ tōst
Az eur thōze klõrn ānd flowdz thāre pĩte neu slēre
Thũ brõx lĩ frõõk swānd krěsh frõm skēte eu swěn
Blānd ěv rĩngz klěr thā hēpt wěr shõn thũ ěēldz.

This passage contains the first fifty accented and the first fifty unaccented syllables of the poem from which it was taken.

INTROSPECTION

B. P. Flows well, and the rhythm is regular and satisfactory; seems to be telling some tale, perhaps slightly epical in nature. Upon reading it a second time, got imagery of a shore and a chivalric or romantic scene; the setting may be slightly sexual in its significance.

F. P. The most pleasant lines are Nos. 6 and 11; makes him think of Anglo Saxon poetry; imagery of an open air scene, with sunshine and flowers; some of the sounds appear remarkably strong for such a description.

K. P. Sounds a little mysterious and melancholy; thinks of English country scenery in the fall of the year,—certainly not in the winter; rather warm, tonally, but not at all deep; felt the pitch to sink a trifle toward the end; surprised that it went even as well as it did; kinaesthesia not noticed.

L. P. Recalls the days of chivalry, and thinks of King Arthur; gives a thrill in the breast to read it, and it all goes very smoothly; felt the accent to be very prominent and expressive; it sounds familiar, but he cannot tell when or where he has seen it before.

M. P. Seems very long; at first the imagery was that of a ship and the sound of the water and the calls of the sailors, but later it changed to a more subtle, and very delicate thing like some romantic scene and idle and care-free people; the consciousness was a sound-consciousness entirely, with the exception of fleeting visual imagery, and the tapping was forgotten entirely.

BYRON, EXPERIMENT XV

The transmogrification of the "Apostrophe to the Ocean," beginning with "There is a pleasure in the pathless woods," and ending with the fiftieth accented and the fiftieth unaccented syllable.

Thũ plāre lēss wĩn ız āth ōōr lōōdz ũ pēzh
 Ū rōn tũre thāre lĩ nōre thũ pāsh ız trōne
 Sō thōn whāre ōōdz ın sī ız thāre zĩk rĩn
 And meu dīts bĩ thũ nōre tēpe lān ě sē
 Nĩ mũv thũ whā frĩn ēēl tēr chĩm bũt lōr
 Ī stĩn thōt mēēz ũre thēs our fĩng bē vāll
 Ī prān thũ wĩn gle nĩth ōt ōr kōn sōō
 And kēs tōō yāre kēt āll rēx tĩd ōm dō
 Lōō bēle ān kār yōle Ī nōt ōn bānd ēpe.

INTROSPECTION

B. P. From the n-drone the passage contains he gets the idea of a forest and ocean scene, rather peaceful, languid and quiet; it may be that some one is philosophizing or lecturing on contentment; quite a lot of sibilants in the passage and frequently "v" and "f," also the liquids.

F. P. Had quite a good deal of difficulty in saying it; and doesn't feel that the ending is satisfactory at all; but the passage is strong and vigorous, with a sort of latent strength and it gives him the idea of something semi-heroic. The staccato effect of "k" is noticed frequently.

K. P. Gets a vivid image of the sea-shore on a cool day; melancholy enters into the whole concept, which is not gotten by any association, but by a direct evocation from the sounds; thinks the passage is homogenous in sound effects, and ability to call up these images and notions.

L. U. (Subject slightly weary.) Nearly every line contains some objectionable sound; "epe" in the last line does not end the passage properly (this passage was presented again later to the same subject, he remembered not having liked it and the experiment was not a success.)

M. P. Imagery of a meadow enveloped by a mid-summer mist; slightly chilly feeling accompanied the imagery; the saying of the lines was rather difficult, and this took all the attention.

GRAY, EXPERIMENT XV

Transmogrification of the first fifty accented and unaccented syllables of the "Elegy."

Thũ nãrt ñg kěl öv pěr thũ dōlĩ slē
 Thũ lērd ăn ā fĩng plō thũ tã mănd plōr
 Hĩz ōm rĩ wē zĩned ōlz eu mōdz thũ wē
 Tōō low nēs wãrk tōō ěrld thũ land ěrd dēvez
 Thũ hĩmměr glĩte wĩng lãdez ănd hĩl zow fōn
 Pã stōl mēn dōlez thũ sãll nēs ănd thũ sãre
 Hĩz bãv ñg sōntle whē thũ tĩ wãre drēēlz
 Thũ siddănt drow lĩsk tũl tĩngz flãve ăt klĩn
 Whăñ yōldz frōm hōntled mour vĩ mowlĩng tãne
 Thũ pō kōm dĩfe thũ sãn tũ mũz děr plōōn.

INTROSPECTION

B. P. Describes something that happened long ago and gives a feeling of content, rest and solace; imagery of romantic country scenery, and now and then sees an old man moving, but not vigorously; very rich imagery and he becomes totally empathic to the scene. The sounds seemed at first rough, but afterwards smoothed down very much.

F. P. Arouses a sober mood, in spite of the fact that the sounds now and

then are dreadfully turgid; gets visual imagery of the outdoors, but it is not very clear.

K. P. Seems hard to say; a very definite mood seems to be latent in it; thinks of the fall of the year and the woods, and now and then a trace of melancholy enters into it; now and then he thought of summer instead of the fall, but it changed again and ended in the latter season.

L. U. Certainly it is not dramatic; it sounds rather sleepy and ineffective (subject does not greatly care for *Elegy*); got no imagery and did not find it easy to say; calls it "inconsequential."

M. U. It "looks" bad, and is hard to say; too many "z" sounds in it, but cannot tell why; gets ideas of lazy people and stupid foreigners,—people that are not up and doing (this kind of human beings are "persona non grata" to subject M).

BROWNING, EXPERIMENT XV

Transmogrification of of "Rabbi Ben Ezra," lines 1 to 13½.

Thū jōld ā mēst īz bōng wūz ēt wō bē
 Tōō lērst ōv whāde thū fē grīth īfe thū chīm
 Fōr hīn īz tast ī lēth ār plīmz ā gē
 Hōō frōle ūst whāde our shānd ōōth sāf ē bōze
 Yā nāl trīng flōd thāt hās būt mānd īch rēēv
 Rē nowrz hā bōze īch mōt īs kēn mānd thīl
 Nōr ēst whāke sāll trāz līde ōm jōt sīng mowrz
 It lārz whēm hōv thāt mērnd ōōth stīre whīch flēndz
 Bē mā theurd sīg yān blārz nōr fēndz ād nāl
 Nōr hī chānd nōpes ūs tōf ōv nūl fān zēēr.

INTROSPECTION

B. P. Seems fairly rhythmic and easy; kinaesthesia is everywhere in the mouth; evokes a mood of matter of fact pessimism; thinks of some middle-aged person, some pseudo-philosopher advising a younger person; is sophisticated, disillusioned and resigned.

F. P. Sort of humorously eloquent; almost physically ticklish; now and then a slightly tragical feeling, but laughed at it; the sounds are very Swedish, it seems, and the whole thing attempts pathos, but ends up with bathos.

K. U. Blundered through the whole thing, and calls it a tonal and poetical blunder; rather rhetorical in spots, but again positively full of humor; something "citified" about it, too conscious, too sophisticated; it is "speechifying" more than anything else; takes a lot of energy and is full of irregularities.

L. P. Rather dramatic, but has no meaning; sounds like Gaelic or Welsh; may be recounting some tale.

M. P. Sort of a joke; interesting and very light; not hard to read; it is

not important, but it goes well; full of spirit, and sounds a little condescending and amiably superior at times, but she could not take it seriously at all; (laughed much).

TENNYSON, EXPERIMENT XV

Transmogrification of "Crossing the Bar," with the most used sounds in the poem repeated to fill out the last few iambs.

Thũ wõn ñg tēv ěn boun ăz plā năd kērnz
 Tōō rawl nět bēme ěs nōve ănd bārļing mēēz
 Fōr nūs whěn stām whĭch krāme thũ bīde ũs fō
 And tow bŭt flōn ñg twī nēs mōb rō slēme
 Whěn fūr mā lē pŭt chăd ñg rābe thũ nārķ
 Fōr sōō năy drēl tēr gām thũ hō năd wī
 Thār bēēs ă tow frōm ē lănd tēpe ă dōv
 Klā dās mē thī fōr dāv ō lound thũ tē
 Whěn tăf ĭte bēm tōō sŭd thār tow frēn sōō
 Fōr mēth ōm tīse ănd pō năd ũv rē thā.

INTROSPECTION

B. P. Easy to say and produces a feeling of apprehension; never got exactly into it, and the imagery and emotions were indefinite; (subject pondered the passage quite a while after the experiment, but no further introspection was obtained); kinaesthesia is felt on the lips mostly.

F. N. Rather easy to say, and there is a good deal of openness about the sounds, but no imagery came; feels often that the unaccented vowels ought not to be long.

K. P. It is very temperamental, and at times slightly melancholy; thinks of ploughed ground and gets ever olfactory imagery; but there is also a slight monotony (sameness) about it, and at the end there came a feeling of something like listlessness.

L. P. It's very nice, but does not provoke a big reaction; seems to be describing a sad and tragic event; probably the death of a certain person; thinks of many perils, enemies, trepidation and the like. The sounds are wonderfully good.

M. P. Rather easy to say, and line 7 is charming; doesn't seem very serious and makes one think of the sounds of nature; gets imagery of the woods, fields and the like; but the whole effect is quite steady and self-contained.

ARNOLD, EXPERIMENT XV

Transmogrification of "Dover Beach," employing the first eleven lines and a part of the twelfth.

Thũ nãm ız dıle ănd strā lănd sŏn těr vē
 Rō nāre thũ tŏn quıl bīne thũ sęng օv mērn
 Whār kınd ıng sprēēm thũ stāl chēn tife ız kō
 Thũ gŏn frīn līs օv stām blez nāre thũ chēē
 Tū flīs thũ whēē năd zıl thũ hūr dŭm thēn
 Thũ sē drăn wāpe eu towm ăt stīn օv nōōm
 Thũ tī frŏl wēte thũ bāfe ūp tŏle thũ grīs
 Chī pāng thũ stābe ıng krănd hī thăl thũ gınd
 Tū stōōn thũ trăf ız glāke lī kŏs bē swēēmz
 Blăn օr hız rōōn daw nŏle thũ glī mēn zāve.

INTROSPECTION

B. U. Traces of pleasantness in the first part, but at the end it was rather sarcastic, *i.e.* full of a sort of "Schadenfreude." Too many "s" and "z" sounds in it, and too many unusual sound combinations; the first six lines are better poetical constructions than the last four; tried to like it, but the kinaesthetic factor dominated.

F. U. The first line is not so bad, but the rest are horrible, and he does not think there can be any such sounds in poetry; a lot of the words give him pains in the face, such as "glake," "gind," "gris," etc.

K. P. Got a very distinct feeling of standing up and "giving it to some one" in a rhetorical manner; there is a great deal of reserve strength in it, and the pronunciation is very prominent; not moody, like some of the others, but rather stern and a trifle polemical.

L. P. It's tragic; thinks of a combat; there seems to be something dramatic, moving and forceful about it; visualizes a storm at sea, through which the vessel finally rode to safety. This was due to the associational element in the sound themselves.

M. P. At first it was very heavy and labored, and did not delight her soul; then it became better, and visual imagery of the sea with people talking in a dignified and probably hushed manner about it.

SHEKESPEARE, EXPERIMENT XV.

Transmogrification of the LXIVth sonnet, lines 1 to 10.

Thũ rēne hŏv kī whēn fŏst hăv bīmz ěl taje
 Dē rănd օrn tē prīd lăste ăn sēr boud mowrz
 Whī tazed ıt răs woun slăje ăl chīs ănd vōre
 Nē brī tōō sŏf dăl mŏs thũ tow grī hăv
 Fēn gēr tăv sŏ mī hēēn ăd shăn ıj tă
 Tī kŏs ūn woil thũ tŏs օm dıng thũ wănd
 Hŏv stınd ıng kŏv ēm ăne thũ lŏn těr krēēs

Whĩn őr thũ stũn ỉth chēēm ănd nĩs fõn őr
 Dē fānj whẽn tōō wĩth stā kăv ỉ wĩt stoun
 Wĩth tā chũs őr shěd mēlf őr lõs těr nā.

INTROSPECTION

B. P. Has much emotional value, and there seems to be a sexual element running through it; but very rich and refined, even if voluptuous, and it might be taken from a poem which contains a sex-philosophy of life; the lip sounds and the "j" and "ch" sounds are particularly predominant.

F. P. Means nothing to him and the pleasure is in the rhythm only, "j," "ch," and "sh" sounds quite prominent.

K. P. Seems to be of low pitch and is slightly provocative of melancholy; visualizes a market-place full of people; the mood is not depressing, but the kind of a melancholy that one takes delight in. "De rand orn" is very fine tonally.

L. P. Very nice and smooth; narrative and not dramatic; is like Shakespeare in Othello where the story of the ships being lost is narrated (? query, Merchant of Venice). Got no imagery, but tried to.

M. U. Very doleful and depressing; recalls the "Flying Dutchman," and all the attendant weirdness of it; it is minor music all through; at the second reading, it got insistently pathetic as in describing a great loss that was irreparable.

WORDSWORTH, EXPERIMENT XV

Transmogrification of the opening lines of the "Ode on the Intimations of Immortality." Employing the first fifty accented and unaccented sounds.

Thũ strēē bēl grāme ỉt vō nēs mēr năd lē
 Whẽn glĩ năd vāre chũl păr mõn thěl rĩ dēm
 Tōō mĩn đĩd nōre păs tĩngz ẻn drēē wō nēse
 Ỉ trō vẻz kỏm thũ shẻmz ỏ wẻn đũth rā
 Dē nowd ỏv kỏm ỉ tẻse thũ mā lĩ zẻre
 Whĩ nā chănd thĩ lũz frẻm hẻr tow krĩ sặre
 Ath yẻme thũ rĩs hặv zẻē nặz dow thũ tĩne
 Ờr whĩnz ử tặbe sỏ bẻth ỏt hĩ nặd wĩt
 Kẻē vặr nỏỏt whĩ thũ zẻn ặđ sỉl bỏ nẻth
 Dẻ gỏze ặr vủl hặn đẻze thũ nỏỏm ặ nặr.

INTROSPECTION

B. N. Seems rather matter of fact; not what he calls poetry, because it is rather narrative and epical, not lyric and free; seemed easy enough to learn

to say it, and the kinaesthesia is forward; the "z," "s," "d," "th," and "t" sound prominent.

F. P. Rather hard to say; calls it "Kammersprache," rather than poetry; the sensations aroused are akin to those experienced while walking over a muddy, frozen ground. No imagery.

K. P. Arouses melancholy at once; visualizes an English moor, over which he seems to be walking; obscure feeling all the way through, as if hesitating to say or do something; the prominent sound is the "wh."

L. P. Only a very slight organic quiver aroused by the poem; it is barbaric, but enjoyable; thought of Norsemen by association, and also of the Goths. The feelings are rather lukewarm.

M. P. Images a cliff overlooking the sea and of someone on the cliff telling tales of the sea; it is very appealing and peculiar; thought there were many full cadences in the poem. At times it became very confidential.

SHELLEY, EXPERIMENT XV

Transmogrification of the first fifty accented and unaccented syllables of the "Stanzas written in dejection, near Naples."

Thũ mǎrn ǐs wēřǯ klāve ũn wīle ěd zāre
 Wǐth sǎnt ěnz brēm thũ tound ǐt pār thũ skō
 A wǐn ǐz nōōm ěld voin ǐ sũl ǐts brēē
 Thũ nēlf ǐz pēr shũn zīt ěnt rast thũ vound.
 Trĩ lō brānd shōn ǐ pānd thũ grē lōv sērth
 Dē moidz ǐt nũs thũ swēn lēx mērdz ũp tīse
 And stēē kār sōth ǐ bĩndz lĩ tois thũ dōft
 Zǎn ēēps ǐz pērn ǐk fēēs ũp strōn thũ trōve
 Zē pām thũ flōōdz wĩ bōrs pũl tĩ wũd lĩs
 Thũ wũz ōv tōs ǐ zũd lũ flāves ěd wĩ.

INTROSPECTION

B. P. Gets imagery of the sea and the splash of the surf at once; seems very onomatopoeic; and in spite of the fact that there is much "s" and "z" in it, it is pleasant, but by virtue of the imagery only; gives a vague feeling of uneasiness and there are many bodily tensions.

F. P. Rather moody and sombre feeling aroused by it; there is much mouth movement and one has to slide to some of the words and stop hesitatingly before others of them; feels tense, not on account of the pronunciation wholly, but on account of the mood.

K. P. Feels as if he is reading a somewhat morbid fairy story, and the emotion is one of mystery and helplessness; this comes direct, and is not associational at all; at first there was a feeling of withdrawing from the mood, but this soon ceased; it seems to be bound up in the sounds themselves

and in nothing else; the frequency of the long vowels being unaccented seems to heighten the power of the poem to sustain its mood.

L. N. The sounds are good, but he cannot feel the connection between them; now and then it seemed as if the whole thing would get unified, but it never did.

M. U. Very depressing and disappointing; arouses a mood in which one feels helpless; so many interesting sounds in it, like "gree lov serth," etc. The first five lines are cheerful enough, but the last five are doleful.

COWPER, EXPERIMENT XV

Transmogrification of the well known lines: "Knowledge and wisdom, far from being one," etc. (This was selected, not as poetry, especially, but as a test of whether the transmogrification of a didactic, homiletic poem would be successful.)

Hāv nōl īng bār dōm fōn īj wēēn ōm ēlz
 And ōl frōn wēk īth nōft ēr nīz rē dwēn
 Kīn plō dīj māwts ōv thēēt wūn hūth īmz ōr
 Shōm wēn tīn mīz thāt rōne tīv zēde mā tīnds
 Thū prās īj mōf īch tōō nād zōme īts bōōd
 Ā wēre ālz tāse īl smāred ūn tīz īt plēre
 And wīth ōm dōōth whār zīld ēn fōl ble chīm
 Dīz bōō thāt rowd nō prīt ūs kērnd ōm squē
 Sō lūt hāz whēēmz īt chūmbēr nāt īz hōōm
 Hē sūmble nīz dēd wūth ēn hūm dīz nōl.

INTROSPECTION

B. P. The prominent sound elements are the "n-drone," the dentals and the labials; got no imagery and no meaning; commonplace.

F. P. Very queer thing; full of pauses, and the rhythm feels like the different steps in a fancy dance; besides the rhythm, there is not much to it; as far as meaning is concerned, it sounds like optimistic speech-making.

K. U. Seems cool, emotionally; rather rhetorical and arouses no imagery; in spite of its poverty of emotion, and its unpleasantness, it is interesting.

L. N. It is not dramatical, deep, or poetical; it's like Pope.

M. P. Amusing; like some moral story to be told to youngsters; line 1 starts out grand and almost epical, and then the whole thing tumbles and never regains itself till the end.

DRYDEN, EXPERIMENT XV

Transmogrification of lines 94 to 103 inclusive, of "Absalom and Achitophel."

Dē möv ěr pränd ōm däll ĩsht āz hĭm pĭved
 And lŭb ěz tĕsh ār flānd ōv lŏöd ũz blārd
 Kā hŏst wĕr yāx ānd grĕt thār wānd ěld bŏdz
 Tōō gĕrnt ōn stŏm thĭs kā thĭke sŏöd thār whāme
 Dāl prŏt ōöd ĩn thĕn flĕt thŭ hĕ mĭs präll
 And sār thŭ stĕē thŭnz jĭl ōv mā fŏr stĕēs
 Rē bŏd sŏ rĕse thār hĕnt ōv hĭz dē gŏme
 Lĭ grŭth ōr whĕē bŏöd pŏne ōk stĕnz ĩn sār
 Hāz dŏle thŭ fĕēb ěn gāt hĭs ōrn stĭn tĕēb
 Hŏv ěd ānts ĩf hĕ hād ĩz bĕr vā dŏle.

INTROSPECTION

B. P. Predominantly dental; seemed rather easy to learn; quite matter of fact and denotes activity of a non-poetic character; some people are doing something,—all the way from arguing to moving vigorously about.

F. N. Very unpleasant caesural pauses; very heavy and clumsy, and cannot be lyric poetry, nor written by any one who knew the musical value of sounds; tried to get away from it and couldn't.

K. P. (Laughed.) Humorous and countrified; seems to be telling some "yarn,"—a good big one; the speaker is perfectly willing to hear himself talk; tonally, it is just an interesting collection of noises.

L. N. Got no reaction from it at all; it never drew his attention fully and he began to think of other things.

M. U. Feels like going over a rocky road; felt no rhythmical swing except at "hiz de gome"; no imagery.

DRYDEN, EXPERIMENT XVI

Transmogrification of lines 66 to 78 of "Alexander's Feast."

Thŭ vound ĩth hāne hĭz dŏŏth ānd ōr grā säll
 Fōō nābe thŭ gĭng ěd slantĕlz tāse hĕ kŏze
 And thrāsĭng fōō thŭ räll ĩz townĕss rād
 Thŭ mĭze ānd slāwmĕnt glŏtĕr chĭze thŭ fĕv
 Āwt thrĭde hĭz kĕēs ěn sār wĕ hĭle dĭz thĕr
 Hĕn frĭse ěn pränd hĭz chŏrn ĩz mew hĕ dānj
 And tĕk ĩs chĭ hĭn däll ōft whĕēr fŭl zŏme
 Hĕ tewz ěn chäll ē zŏöd ānd fĭse hĕ tāfe
 Dĭ hŏn hĭz rĭt ānd tā dē sŏŏf hā gräll
 En pĭfe ũs tā sē fŭng bā stĭge ā tŏŏve.

INTROSPECTION

B. P. (?) Hard to say; the "s" and "z" sounds predominate, and somehow make it sound gummy; feels that the cheeks have moved a great deal; hissing

and breathing is frequent; it is both difficult and amusing, and he cannot get any meaning out of it.

F. P. Thinks of trotting horses and movement in the open air; but this he holds to be due to a direct association from the words "soof" (= hoof?) and "ritand" (= reiten [Ger.] which he pronounced with a long "I"). Goes easily and quickly.

K. P. Very smooth and interesting; gets a cobwebby mood of mystery, but doesn't know why; feels that many of the expressions in such a passage will turn into words, if one looks for words.

L. N. Gets no reaction whatever. (N.B.—Between this and the previous passage experimented upon, Subject L. relieved his mind of certain matters which were annoying him, but not even then did any reaction to the above poem take place.)

M. U. Dislikes the looks of it; it sounds blatant and impudent and is full of the most difficult combinations possible.

SPENSER, EXPERIMENT XV

Transmogrification of Stanza 34, Canto I, "The Faery Queene," with the most used sounds repeated to complete the last line.

In lāz ĭt wērtle hō mī līt ā tāje
 Lī fīde ā sown ās dārd ōv ōr ěst ēde
 Rē hāle ĭd zār dōm tōrple tāth āl fās
 El pāv ā tīl bī frōtle wōō thēl dīte
 Thū trōtle fīde ār wīn lī hāz ĭ chēr
 Tōō mīngz ĭt hāde lī sōnt ār tew frēn dē
 And bīde lī pōrn hīz krā chā wīs tāl pāj
 Thāt wēēm ĭd hō dēn līt ā fōm ěd plī
 Chī thōr lī frēnt whā thā krē toun lī wāse
 Whā lō mī pēr nād fēv ěd strēl ĭn tāje.

INTROSPECTION

B. P. The vowels seems very predominant; the dental consonants rather numerous also; very poetical substance in it, but cannot get at it; upon a second reading notices the liquids more than the dentals, and the sounds seem very open, but this does not make it at all oratorical,—rather quiet and restful, instead.

F. P. The lines containing the words that end with "tle" remind him of Maeterlinck's "Blue Bird"; direct association; some of it very easy to say and some of it very hard; wonders what the frequent repetition of the word "taje" means.

K. P. Easy to say; not exactly melancholy, but something very akin to it; no content suggested, just this strange feeling of artistic melancholy.

L. P. Excellent Jabberwocky; got a rippling feeling down the back;

doesn't seem to be anything very tragic and vital; just like some nice little quiet talk.

M. P. The words ending in "tle" are at first very quieting; then the "look" of the letter "j" annoys and seems to color the whole thing; would become unpleasant upon very slight provocation.

SHAKESPEARE, EXPERIMENT XIII

Shall I believe

That unsubstantial death is amorous,
And that the lean abhorred monster keeps
Thee here in dark to be his paramour?
For fear of that, I still will stay with thee:
And never from this palace of dim night
Depart again: here, here, will I remain
With worms that are thy chambermaids; O here
Will I set up my everlasting rest,
And shake the yoke of inauspicious stars
From this world-wearied flesh.

SHAKESPEARE, EXPERIMENT XIV

Thũ lãn sãl dē shēr nãn ăt rũs ăb stēn
Iz kīn ũl mēēps ănd hãn bē mōr sũb lĩth
In thēēr shă dăl hĩz pâr thēd bōth ĩl stōōr
And ēēp thōv hāne tōō stāl fēr tōv ĩth rēēsp
Stĩ fēv ōr nōm ĩs gēē fũl wēn dē thĩte
Wēr pēm dās hāne ă chĩ wē lă wĩl frēēr
Bō mǎ thēr zũd ĩm spār thăt hĩ wĩth pāme
Rē shēr ĩng tēv ęt rǎst thũ kǎ wēēr flũn
Mĩ lēs ănd wēēr ōv kō thēr yǎst ĩd rēēsh
Hĩ zār mōld sĩth aw rĩk wēr zĩm ũs rēēt.

Shakespeare, Experiment XIV. Transmogrification of XIII

INTROSPECTION

B. P. The sibilants do not disturb, although they are very numerous; gets visual imagery of the woods and the sea; the general aspect is quiet and solemn; seems restrained and hushed; no activity in the notion aroused,—can hardly tell what it is.

F. P. Seems delicate and soft, with only a few interruptions such as "reesp"; rhythm is both quickened and slowed in places, and he rather likes the necessity to stop and begin again at a different tempo; feels like the resolution of dissonances, every time it occurs, which is usually after a difficult word, or one that causes readjustment of the vocal organs afterwards.

K. P. Smooth and easy to say; doesn't get any definite imagery, but the general effect produced is rather subdued; thinks of either a calm on the sea, or a suspense of activity; the thing has a lot of meaning, but it is very subtle, and for him, latent.

L. P. Not epic, but lyric; seems pastoral, rather than anything else; the opening lines reminded him of the tonal effect of Gray's *Elegy*.

M. P. Would not have been surprised to have heard an organ keep up the tonal effect after the end of the passage came; there is a rumble of heavy, grand tones underneath, as it were, the sounds as spoken; it is not the rhythm that is the prominent feature, but the sound-mass, which is surprisingly new and agreeable.

We have omitted from this list a small number of experiments made after the same pattern: Coleridge's "Christabel" was tried, but proved introspectively unsuccessful; likewise three songs from Shakespeare made over into five-line passages,—"Hark, hark, the lark," Ariel's Song, and the Boy's Song from "Measure for Measure." Likewise two passages from Swinburne's "Laus Veneris," two from Rossetti's "Blessed Damosel," and one of Sydney's Sonnets. Jonson's "Drink to me only with thine eyes" as well as a passage from Pope's "Essay on Man" fell flat.

The writer usually found it more difficult to transmogrify the shorter verse forms into decasyllabic lines than the others. Tonal replicas were less easily elicited from such passages, which having been cast into a form tonally demanding other than the decasyllabic pattern, remained recalcitrant to the pulverizing and agglutinating process of this experimental method. Soft as the tonal data of poetry may be, yet it would appear that the various form-orders of verse lie not in intersecting series.

RANK LISTS FOR THE EXPERIMENTS PERFORMED DURING THE THIRD YEAR'S WORK

I. Mean Subject	Keats XV	Byron XV	Gray XV	Coleridge XV	Browning XV	Tennyson XV	Shakespeare XVI	Arnold XV	Shakespeare XVIII	Shakespeare XV	Wordsworth XV	Shakespeare XVII	Shelley XV
B.	c	c	d	e	c	d	c	c	d	c	c	c	c
F.	e	e	c	d	e	e	d	d	d	c	d	c	c
K.	a	(throughout)											
L.	b	b	b	b	b	b	b	b	c	c	b	b	b
M.	d	d	e	c	d	c	c	e	e	e	e	e	d

Experiment	Accented short vowels	Unaccented short vowels	Accented explosive consonants	Unaccented explosive consonants
Spenser XV.....	18	41	43	19
Browning XV.....	24	32	31	20
Dryden XV.....	25	33	40	19
Swinburne XV.....	19	31	31	15
Dryden XVI.....	10	38	38	17
Swinburne XVI.....	15	27	24	18
Rossetti XVI.....	26	27	37	13
Shakespeare XV.....	19	28	24	21
Rossetti XV.....	19	33	27	17

By referring to the graphing for the two experiments on Shakespeare, XIII and XIV, it is found again in this case, as we have noticed before, that the transmogrification of a passage of poetry tends to arouse the motor consciousness more than does the original poem.

From the above results, it seems clear that the short vowels and the explosive consonants, regardless of accented or unaccented position in the poetic foot tend to produce the strong motor arousals; but this was not the case with the earlier experiments in which the single line was repeated five times in succession; nevertheless, the summation of effects is evidently what accounts for it, together with other factors not to be overlooked. The motor setting preparatory to tapping a long passage of verse is different from the motor setting which merely repeats the same line over and over again; and with the appearance of new combinations a stronger effect is produced by the addition of like elements than by a great variety of elements giving no effect of homogeneity; once the feeling produced by the short vowels and explosive consonants is aroused, even the lessening of their number per line in the following lines might not show as soon in the motor consciousness as it did in the introspective consciousness; instances of this we have seen in the previous pages. But it does not seem to work the other way around,—the effect of explosive sounds is immediate upon the motor consciousness, and one such sound can mar the effect of an otherwise placid and liquid line, and this may account for the apparent partial lack of definite

one to one correspondence which we have sought for in connection with our study of the motor energies and the introspective consciousness both singly and together.

Allied to the characteristic form-quality in the graphs for each individual poet, especially in the more meaningful lines experimented upon, is the matter of the tapped strokes as they appeared upon the smoked paper ribbon. After they had become accustomed to the tapping, every one of the subjects tapped in what could be called a thoroughly individual manner. Some of them tapped slowly and with great deliberation, thereby making a visible record of very rounded loops; others would react by a very quick down-stroke, followed by a slow, hesitating up-stroke, while still others would tap strokes that appeared on the paper as very fine points, or even in some cases would move the finger so quickly that the pointer climbed the roller on the up-stroke and returned with sudden relaxation of the rubber band in such a way as to make a loop in the smoky surface of the ribbon. And here lies the interesting point: that in the variously individual records there appeared evidence of all felt and unfelt changes in the emotional character of the experiments presented; tenseness of the vocal apparatus as well as the opposite state could be told by the experimenter as well as by the subject, together with subliminal effects of one sort or another which the subject did not feel either in summation or otherwise. Illusions, also, of various character were there evidenced, such as temporal and numerical ones. In general, the qualitative and quantitative aspects of the visible record amply supplemented the introspection in every way.

We have made no special mention of the time element in connection with most of these experiments. This is because the graphs are so typical for each and all of the subjects, that individual mention is unnecessary; furthermore, the time element does not seem to play any very important rôle. It certainly is no special correlate of any of the affective elements in consciousness; and it does not seem to be a manifest index either of difficulty in the material to be recited or of the number of sounds in the decasyllabic line. The subjects were all told to take their own

time in the tapping; this was merely to assure them that they were not to be hurried in what they did. This, however, is to be noted as the regular temporal manifestation of all the subjects: the repetition of the same iambic line five times usually showed on the record as having taken longer time with each repetition,—that is, the oftener repeated, the slower it became, though none of the subjects were aware of it. This may have been due to a number of things: either slight muscular fatigue, or else to the fact that as the impression aroused the introspective and the esthetic consciousnesses more and more, less and less nervous energy was sent per impulse per unit of time into the finger. That it was not due to imperfections in the machinery is clearly shown by the fact that the ribbon was allowed to pass several inches before the pointer was dropped upon it and the signal to begin was given.

A very pertinent question to be asked about all this work is,—“What had the subject’s general condition, mental and otherwise, to do with the results of the experiment?” A careful record was kept all during the second and third year as to how the subject felt at the beginning of the experiment and the results showed that the main effects of fatigue and other sub-normal states were of several kinds: 1. A less high degree of pleasurable can be aroused in the state of fatigue; 2. The mean variation of the tapings on fatigue days is less than on normal days, but 3, that the subject did not reverse the results of the previous experiments at all,—those who showed a positive correlation showed it still, and those who before had showed either a definite negative correlation, or a scatter and miss correlation also continued to do so; the more the experiment develops, the more it seems that we were getting motor correlations with respect to the vocal apparatus, rather than results which attached significance to the total psycho-neural mechanism. But to return to the matter of fatigue days, only one of the subjects, L., tended ever to nullify his previous results, but then he also attempted to guess at his own type of correlation, and this guess may have influenced the tapings for that day.

Not every anticipation or conjecture with which this work

began has been verified by the experiments so far presented. But that the first statement of the thesis was not so dismally at fault is at once evidenced by the introspection on these large transmutations of English poetry; the tonal elements of the poetic line do seem indeed to have the power of arousing a mood congruous to that of the original poem, even when torn from their positions and their rhetorical anchorage, and recast into such form as is shown in the above experiments. The subjects did not know at the time what poems were being given them in this potpourric manner; they only knew it was some poem, and that they were to introspect upon it; but it was not a guessing contest in any sense of the term,—all intimations that it was to be such were stifled at once; and to the subjects must be given due credit for their admirable interest in the experiment from start to finish, for in such fragile matters as the moods of the esthetic consciousness, any hostility or any lack of true scientific interest would have been fatal to the purpose in hand.

4. THE PSYCHO-PHYSIOLOGICAL VALUE OF THE POETIC SUM

The question of a tonal calculus seems to be the logical development of the foregoing experimentation. It has been shown that short vowels and explosive consonants are provocative of more motor arousal than the long vowels and the liquids. Strictly speaking, as has been indicated before, the term "long vowel" is equivocal. Except, of course in vocal music, where the long notes rightly function their enunciation. But if the question be asked: can we say that this or that number of sounds will produce this or that effect? the answer cannot be given in the affirmative without the following reservations: effects can be calculated, provided the number and arrangement of the sounds be taken into consideration. In the above experiments it appeared that if a number of explosive sounds began the line or the passage, then the motor manifestations were intense, and also that such manifestations did not wear away as soon as the type of sound had changed to some less intense one. Changes in the apperceptive

consciousness did not either run parallel with the motor pattern nor did they very often seem to be influenced by the finger as much as by the page of print. Yet the introspective and motor results were parallel in other ways, as has been mentioned so frequently before.

Only so far as we had data from simple vowel and consonant experiments, could a tonal calculus be made. And so, when even in the simplest of the I-XII experiments, there were found sounds upon which no previous experimentation had been done, their values were not known in the same way as the values of the simple sounds previously used, and no two lines of the I-XII experiments could be found which had the same common parts known and unknown, in respect to psychomotor value.

Much thought and time was given to this matter, and for a while it looked as if we had arrived at a solution of the problem involved. But it had to be given up, and for this reason: that while in nearly all the cases tried, the psychomotor values of the separate letter sounds as found in the ninety-six preliminary experiments upon the single vowels and consonants showed in summation to be equivalent to the psychomotor values of the first three experiments performed upon each of the poets, and that as more and more meaning came into the experiments the sum was affected by some other element,—yet inasmuch as we did not have enough tonal elements to make a full correlation, and inasmuch also as the later poets experimented upon did not give favorable results, presentation of data and pressing of proof is withheld at this time. We had but four long vowels and no short ones, and it is likely also that the average motor effect of the consonants we obtained would have been greatly modified by further experimentation with other vowels, both long and short. Hence this problem of poetic sums remains for the time being unsolved; were this experimentation to be repeated, that problem would stand uppermost in the attempts at correlation.

Only in the longer passages does there seem to be a trend toward a tonal calculus. And here, the surprising thing is that a very small number of explosive sounds in one passage over

takes and lead our results to something finer and more conclusive. Eight years of work culminate in the results we have brought forward, in which years eighteen thousand lines of poetry were phonetically measured and tabulated, involving the enumeration of nearly 540,000 sounds; the measurement of the records obtained in the laboratory involved nearly 300,000 bits of data; the computation of the mean, the mean variation and the range for all the experiments and the making of rank lists brings the total number of computations to more than a million, and with all this labor, it might seem to some that far more should have been found out concerning the psychophysics of poetry than we have to offer in closing. But the introspective consciousness and the motor, too, are not such things as can be coerced and cajoled,—all their laws are by no means sun clear, and to have found out something definite is better than to have been given only shadowy hints, promises, and false signs to advance.

There were in all fifteen persons who took part in this investigation. One of these was an instructor in the Department of Psychology. The rest were mostly graduate students in the Laboratory. Five were women from Radcliffe College. All were trained introspectors.

The following scheme shows what subjects took part in the investigation and for how long time:

Yr. I	.....	A	B	C		F		L		N		T	W	Z	Y
Yr. II	.....	A	B	C	D	F	K	L	M		P	S			
Yr. III	.....		B			F	K	L	M						

Thus three continued through the whole period, and the some five subjects assisted during the last two years, in which by far the most important work was done.

The following account briefly indicates the chief characteristics of the subjects:

A. Predominantly visual; disliked the tragic and melancholy; closed his eyes whenever possible; nodded head synchronously with the tapping; often read in a slightly mournful tone; it was usually unpleasant for his own personality to be injected into the imagery; good sense of rhythm; very constant and steady.

B. Visual-motor type; enjoyed the tragic and melancholy as much as the light romantic; acquainted with English poetry, favored Byron, Keats and Arnold; he alone of all the subjects gave much introspection of the sensations of the speech apparatus; gave much introspection; good sense of rhythm; steady and constant.

C. Motor type; rarely got satisfying imagery of any sort; had great difficulty to count the five iambics in the "la-mo" type of experiment; sense of rhythm varied much with the type of experiment; introspection meagre; steady and constant.

D. Very visual, with highly colored images; artistically gifted and fond of poetry; enjoyed the bizarre as well as the sombre; rather volatile, but rebounded instantly from depressed states; strong sense of rhythm.

F. Visual-motor; fond of poetry; good declaimer, and often varied from a steady recitation of the material experimented upon; articulation sensations often seemed to determine the imagery; German: had some slight difficulty in pronouncing the "th" and other sounds; strong sense of rhythm; constant.

K. Visual-auditory-motor; musical performer; esthetic; liked the melancholy; voice usually of medium pitch but very low intensity; pitch constantly noticed; feeling of hoarseness accompanied low pitches; tapped very short strokes, often no more than 12 mm. in length; syncoped the tappings very frequently; good sense of rhythm; constant.

L. Visual-motor; artistic, and fond of certain kinds of poetry, *e.g.* the sound of Shelley's and the content of Arnold's; introspection varied much, from bare feeling-tone to full auditory-visual-motor content; very apt in describing vague content by fitting analogy; good sense of rhythm; steady and constant.

M. Motor type; practical, and impatient of most poetry; often given to intentional changes of extent of finger movement; wanted objective finger control (the most inconsistent subject as far as any feeling-tone = motor-discharge correlation was concerned); said: "I have a good sense of rhythm," which did not always appear.

N. Motor-visual; philistinian toward most poetry; frequently interrupted the experiment with a Phillipic on the impracticability of art; good introspector; good sense of rhythm; fairly steady and constant.

P. Motor type; musical; singer; enjoyed the less romantic forms of poetry; meagre imagery; left-handed (the apparatus was accommodated to him); tapped the longest strokes of any one (140 mm.) with the smallest M.V.; good sense of rhythm; steady and constant.

S. Visual-motor; enjoyed poetry of all kinds; introspection often by tactual analogies; had difficulty with the language, being a native of India; good sense of rhythm; fairly steady and constant.

T. Predominantly visual; fond of all kinds of artistic work; introspection clear, often chromatic; sense of rhythm well marked; steady and constant.

W. Visual; practical and little acquainted with or appreciative of poetry; counting the five iambics often very difficult; tapping never become pleasantly automatic; steady and constant.

Z. Visual-motor; enjoyed poetry and was somewhat gifted in verse-making; lack of imagery in the introspection often disappointing enough to change the whole feeling-tone; steady and constant.

Y. Visual; acquainted with English poetry; introspection rather meagre; strong likes and dislikes; good sense of rhythm; steady and constant.

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